The Chemical Age

VOL LXI 26 NOVEMBER 1949 No 1585

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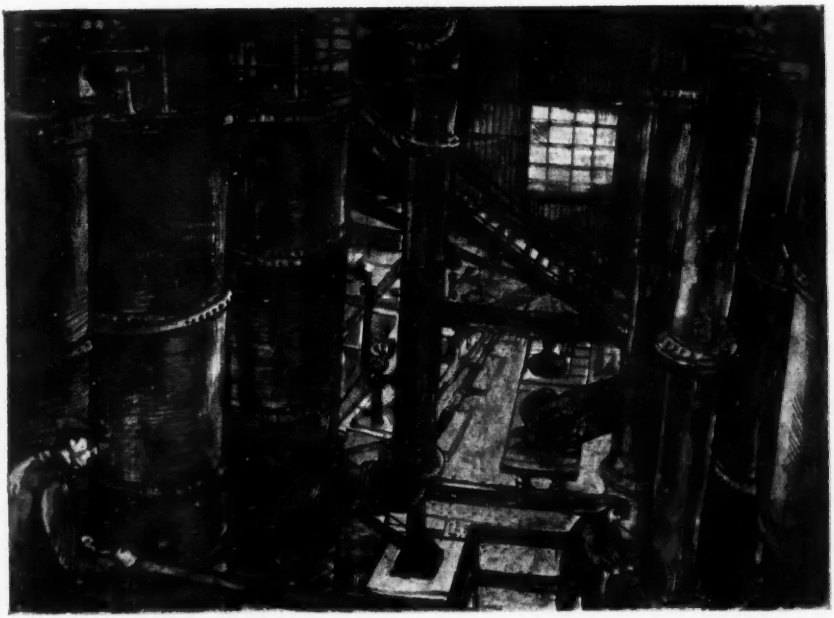

Key chemical

OUR ILLUSTRATION shows one section of the square mile of our Avonmouth works. Here—and at our Seaton Carew, Swansea and Newport factories—we produce sulphuric acid in quantities which rank us among the largest sulphuric acid producers in Europe.

One of our special points of pride, by the way, is that in 1939, when war jeopardised supplies of imported vanadium catalyst, we were able to step up production of our Imperial Smelting Corporation catalyst and to supply this first-rate British product to so many other sulphuric acid manufacturers.

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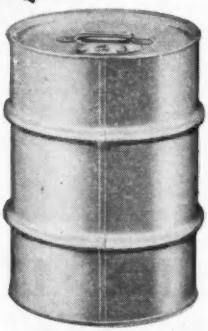
MORE PROGRESS in DRUM DESIGN—

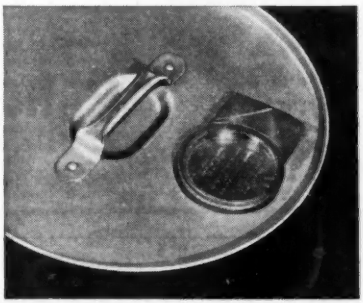
Most users of metal containers are aware that READS of LIVERPOOL have always striven to progress in matters relating to packaging design.

We now announce three further innovations in drum design.



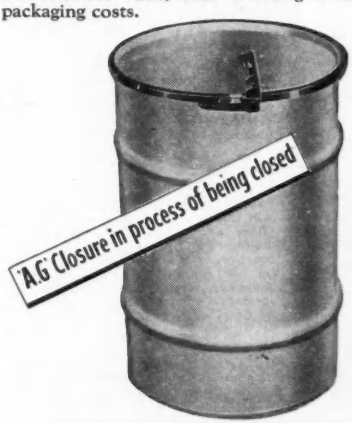
New locked-seam roller hoop drum

The incorporation of pressed-out roller hoops in tinplate and terneplate, locked side-seam drums — a major development — adds considerable strength, increases rigidity and makes for greater resistance to damage. Drums may, therefore, be used in lighter gauges than have been normal, on a returnable basis, thus effecting a saving in packaging costs.



New patented handle

The new handle with smooth turned back edges prevents chafed and cut hands even when carrying a heavy drum. The appearance is greatly improved and the strength and rigidity considerably increased.



New double-secure "A.G." pattern hoop closure

The new patented A.G. hoop is a major development in closure design for the larger full aperture drums. Neat in appearance, it has minimum projection and thus facilitates the rolling and stacking of drums and reduces the risk of damage. It can be opened by a simple upward motion and is snap-closed without the use of tools. It incorporates a special tightening link and further, it will remain securely closed, even if the rivets are accidentally broken by rough handling.

—BY READS OF LIVERPOOL

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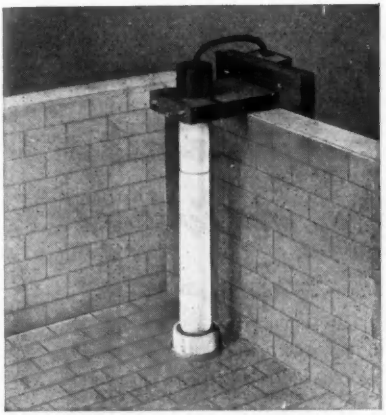

Suggested method of installing a Vitreosil Electric Immersion Heater in a tiled tank

THE IMPROVED PATTERN

VITREOSIL

(pure fused silica)

ELECTRIC IMMERSION HEATERS

are ideal for heating acid pickling and electro-plating solutions, and other acid baths.

FEATURES :—

- Increased heat transfer per unit area.
- Greater resistance to chemical attack.
- Moulded rubber cap provides efficient sealing and facilitates installation.
- Earth wire inside VITREOSIL sheath for additional electrical protection.
- Minimum safe immersion depth marked on each heater.

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The
Chemical Age

The Weekly Journal of Chemical Engineering and Industrial Chemistry

BOUVERIE HOUSE 154 FLEET STREET LONDON E.C.4
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Coal Gas and Chemicals

FROM any picture of the coal gas industry in recent times cannot be excluded a very large and important sector of chemical industry. The materials of fertilisers, dyestuffs, plastics and nylon filament, pharmaceutical and fine chemicals and motor fuel, all come so fully in one or other of the processes of extracting and processing the main product of the vast gas industry that few sections of chemical industry itself could escape serious impoverishment if those services were curtailed. Some closely related chemical industries could not operate at all. Those facts are known to almost everyone and few have not heard of the great coke oven batteries at Beckton, whose output of chemical raw materials is larger than that of any of the numerous plants of the kind at work today.

There is thus some excuse for thinking that an enterprise so essential to nearly every industry in the country and of such vast proportions as that which has been taken over by the Gas Act must be a venerable edifice. In fact, the modern gas industry is almost entirely a recent creation compared even with some of the chemical industries it serves, although its antecedents are antique enough to qualify it for a place in an industrial Debrett. Without the orginality and vision of William Murdoch, Boulton and Watt's young Scottish assistant, in carbonising coal to light with gas his house at Redruth in 1792—as the ninth Earl of Dundonald had himself done about 12 years earlier—a generation or so might well have elapsed before a start was made on the great adventure of converting Londoners to use a more scientific source of lighting than whale oil and tallow. Murdoch and the Scottish nobleman were, however, only the precursors of a great procession of visionaries and merchant venturers, whose determination in the face of all imaginable impediments conferred on the country means of tapping more abundantly the greatest single source of chemical raw materials. That, paradoxically, was possibly the last of the incentives which drove on such men as Frederick Winsor (and Lebon in Paris, from whom he filched all the first principles), Samuel Clegg, James Ludovic Grant, Frederick Accum, James Hargreaves and their contemporaries, adversaries and successors, whose story has now been brought to life with a wealth of colour and detail in " The History of the Gas Light and Coke Company, 1812-1949."* The title seems to do less than justice to the

* " The History of the Gas Light and Coke Company 1812-1949," Stirling Everard ; Ernest Benn, Ltd., 63s

On Other Pages

The annual subscription to THE CHEMICAL AGE is 30s.; single copies, 9d.; post paid, 1s. SCOTTISH OFFICE: 116 Hope Street, Glasgow (Central 3970). MIDLANDS OFFICE: Daimler House, Paradise Street, Birmingham Midland 0784-5). THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

book, for the story of the company, first in that strange and chequered field, is the story of the birth of the coal gas industry, of which so many eminent figures in the history of scientific advance—Sir William Congreve, Davey, Dalton and others—acted as consultants.

The fortunes of the gas industry can now be seen to have been the prototype on a grand scale of the pattern of many other chemical processes in their early stages. First objectives prove to be will-o'-the-wisps in the light of the greater attractions of simple alternatives or by-products and success comes from the unexpected quarter. Thus the thermal properties of coal gas weighed hardly at all in the estimates and hopes of those who secured in 1812 the Prince Regent's signature, on behalf of George III, to the Charter permitting the Gas Light and Coke Company to supply gas for 21 years to the Cities of London and Westminster and the Borough of Southwark, etc. The whole of the early history was concerned with the herculean struggle to convert London to acceptance of the batswing gas light and to disregard the highly suggestive evidence provided by the frequent conflagrations and the evil-smelling concomitants, in which sulphur and a great range of tar products mutely clamoured for recognition. To this there appear to have been but two exceptions, the ammonia products, sal ammoniac and sulphate of ammonia, and coke, for which steady markets were built up in less than 20 years. Of the possible advent of "Mr. Therm" there was no hint.

It is a sobering reflection that the Gas Light and Coke Company and many others for more than a generation steadfastly regarded most by-products as unmitigated nuisances. The feeling is well illustrated by the Gas Light and Coke decision, in 1814, to rescind the appointment of one who would now be styled a by-products research director—with a gift of two guineas "for wasting his time." An ocean of tar was passed surreptitiously through the waste pipes to the unfortunate Thames or, at a more enlightened stage, was carbonised purely for its gas content; great quantities of ammonia liquor, when neglected markets slackened, joined the wasteful flood of effluent. That aspect of the story, which a contemporary congress

(*continued at foot of page* 726)

Notes and Comments

Chemical Trade with U.S.A.

THE overseas trading accounts for October have more interest than most of their monthly predecessors because of the glimpses they afford of imports since devaluation. While no illusions can have been entertained that chemical materials from dollar sources would not involve very much higher payments in terms of the cheaper exchange, some typical effects are striking. Examples are borax, of which 9900 cwt. was acquired in October, 1948, for £13,111, while 14,511 cwt. last month cost £25,692; glycol ethers, etc., requiring in one month £12,668 for 221,300 lb. last year and £30,898 for 308,241 lb. in October last; and carbon blacks, of which some 41,000 cwt. imported in October cost round about £2000 more (£188,078) than did approximately 60,000 cwt. 12 months before. The limitation of expenditure in October on U.S. chemicals to some £483,000 (£767,900 in October last year) appears to reflect a very stringent pruning. Chemical exports to the U.S.A. in the same period were reduced to £137,000 (£151,000 in October last year). The grand total of the overseas chemical trading account, £7,640,000 for all groups, compared with £7,170,000 12 months ago, may not have borne the whole effect of new currency values, but it clearly shows a solid contribution by chemical industries towards balancing the export account by direct sales.

Invasion Tactics

ELSEWHERE in this issue Sir Ernest Benn comments in characteristically blunt and practical terms on the little lecture with which the Prime Minister recently favoured industry at large on shortcomings in the dollar export drive. Our New York correspondent also has something to add towards conveying a more realistic picture of what one of the British exporter groups is doing. His contribution concerns the Associated Paint Manufacturers, Ltd., the 140-odd makers who, more than 18 months ago, set aside a wide diversity of entrenched commercial policies to invade the overseas markets under one standard, the collective trademark "Asopan." Paint industry experts in New York and farther afield have now witnessed with something verging on incredulity the effects of the first sortie of the Asopan force in their home preserves. Paint sales in the U.S.A. are worth the equivalent of nearly £400 million a year, at the present sterling rate, and the American paint industry is probably more highly developed than any other. Last year the share of the vast annual turnover which fell to the United Kingdom is stated in New York to have drained off only $400,000 of approximately $1000 million the U.S.A. spent on paint. That, however, was before the APM task force had been briefed. Now, it is being noted in New York, Asopan can be found in all the states in the Union and knowledgeable paint executives do not disguise the fact that it may represent a real competitive factor, even if it need not be regarded as a serious threat.

Chemical Engineering Students

ONE of the most welcome announcements to have come recently from the Ministry of Supply is the news this week that it is to make its own contribution to the facilities for the training of chemical engineers. It is a small offering, embracing the further education of only 12 students each year, but, so urgent is the need for qualified chemical engineers, the new proposal is not to be despised. The scheme, to begin shortly, will give training in chemical engineering to selected apprentices in Ministry of Supply and development establishments and Royal Ordnance factories The 12 engineering apprentices to be picked each year must have completed their third year of training under the

Ministry's apprenticeship scheme. At least half of them will be accepted as full-time students for the B.Sc. degree in chemical engineering or the professional examinations of the Institute of Chemical Engineers. They will study at Universities and technical schools, spending their vacations in practical work at the establishment of the Ministry to which they are attached.

Slow Release of Metals

OPTIMISTIC hopes that prices of base metals as well as their chemical derivatives were soon to be relieved of the burden and expense which Government control has imposed during and since the war prove to have been premature. The grip of this particular Old Man of the Sea (whose habitat is somewhere in the Ministry of Supply) is not likely to relax in the immediate future, according to those who would gladly see him unseated. Meanwhile, the deliverance of tin into the safekeeping of the partly resuscitated Metal Exchange, on November 15, has not yet brought the measure of freedom in supplies and prices which a free market can, and will confer. Although there has already been some assurance of a welcome retreat from the Ministry price levels for tin—which seemed at times to have belonged more properly to the bullion market—the full benefits cannot be enjoyed while the free market is occupied in re-establishing the lines of supply which the Ministry, before it abandoned them, is reported to have emptied as thoroughly as would an army making an orderly retreat. The Ministry's "loot" is admitted to be 31,000 tons of tin and it shows no intention of releasing any of it at the moment to relieve the needs of industry.

No Cheap Copper

THAT policy is hard to justify, notwithstanding the need of a strategic stockpile, and cannot be reconciled with the Administration's simultaneous demands for new records for industrial production. Whether copper, and perhaps lead, escape from the Government reservation before 1950 is well spent is still wholly uncertain, but there would seem to be little likelihood of any substantial easing of official prices for copper for a long time. That is implicit in the disclosure this week by Mr. A. Chester Beatty, chairman of Rhodesia's Roan Antelope copper mining group, the the Ministry has virtually agreed to receive the next three months' copper output at the New York price for electrolytic copper (17.672 cents per lb.), converted at the new dollar rate. That will assure the Northern Rhodesian producers about £136 per ton for blister copper, which is rather more than £15 per ton higher than the United Kingdom was paying in the last financial year. Non-ferrous metal users may be excused a pang of jealousy when they observe the Ministry of Supply's tender treatment of producers.

COAL GAS AND CHEMICALS

(*continued from page* 724)

on conservation of resources might well take as a classical cautionary tale, was one of the unavoidable results of the absence then of anything equivalent of the Institution of Chemical Engineers and of any recognisable group of people who could have qualified for admission, had it then existed. The men who could have accelerated so greatly the cultivation of the huge field of ancillary activities had not yet arrived and a century was to elapse before that gap was adequately filled. The full awakening, like that of so many departments of chemistry, was delayed until the shock administered by critical scarcities in 1914-18 stirred many to action. The return since then has been immensely rewarding and the process of expansion, even now, is not ended. In token of that was the creation last year of the Coal Tar Research Association, supplementing the wide hydrocarbons research of the Chemical Research Laboratory and the work of the Fuel Research Station, the Gas Research Board and others. The national board which has inherited the great enterprise built up by the gas pioneers and their very able successors has a clear responsibility to exploit further the service gas production can render to chemical industries.

CHEMICAL EXPORTS IN OCTOBER

September and 1948 Totals Surpassed

BRITISH chemical exports in October showed an increase in value, both when compared with September and with the corresponding month last year. October's figure for all chemicals was £7,640,808, against £7,170,726 in the same month of 1948 and £6,994,535 in September this year. These totals include chemical manufactures; drugs, medicines and preparations; dyes and dyestuffs; and paints, pigments, colours extenders. In both comparisons, the figure for value of "chemical manufactures" accounts for more than all the total increase. Notable increases in October 1949 compared with 1948 were: ammonium sulphate 43,463 tons (25,104); tar oil, etc., 4,004,273 gal. (1,580,087); collodion cotton 2264 cwt. (1062); disinfectants 55,500 cwt. (50,535); tetra-ethyl lead 122,937 gal. (107,100); caustic soda 271,344 cwt. (182,998); sodium silicate 33,117 cwt. (27,874); sodium sulphate 56,986 cwt. (39,384); tin oxide 744 cwt. (562).

EXPORTS

	Oct. 1949	Oct. 1948
	Cwt.	Cwt.
Formic acid	3,090	3,539
	Lb.	Lb.
Salicylic acid and salicylates	169,694	184,056
Value of all other sorts of acid		
	Tons	Tons
Aluminium oxide	98	648
Sulphate of alumina	2,756	3,463
All other sorts of aluminium compounds	2,238	458
Ammonium sulphate	43,463	25,104
Ammonium nitrate	3,191	9,520
All other sorts of ammonium compounds	1,638	2,098
	Cwt.	Cwt.
Bleaching powder	13,568	21,218
All other bleaching materials	9,099	9,717
	Gal.	Gal.
Cresylic acid	132,451	184,081
Tar oil, creosote oil, anthracene oil, etc.	4,004,273	1,580,087
Value of all other sorts of tar oil	£76,000	£60,602
	Cwt.	Cwt.
Collodion cotton	2,264	1,062
	Tons	Tons
Copper sulphate	649	1,221
	Cwt.	Cwt.
Disinfectants, insecticides, etc.	55,500	50,535
	Tons	Tons
Fertilisers	1,786	918
	Cwt.	Cwt.
Nickel salts	4,041	5,967
Lead acetate, litharge, red lead, etc.	5,378	17,188
	Gal.	Gal.
Tetra-ethyl lead	122,937	107,100
	Tons	Tons
Magnesium compounds	520	909
	Gal.	Gal.
Methyl alcohol	5,608	13,971
	Oct. 1949	Oct. 1948
	Cwt.	Cwt.
Potassium compounds	4,923	7,970
	Tons	Tons
Salt	18,573	19,995
	Cwt.	Cwt.
Sodium carbonate	311,050	401,165
Caustic soda	271,344	182,998
Sodium silicate	33,117	27,874
Sodium sulphate	56,986	39,384
All other sodium compounds	91,177	96,771
Cream of tartar	406	371
Tin oxide	744	562
	Tons	Tons
Zinc oxide	1,442	1,362
Total value of chemical manufactures, excluding drugs and dyestuffs	£4,383,177	£4,101,775
	Oz.	Oz.
Quinine and quinine salts	100,418	198,787
	Lb.	Lb.
Acetyl-salicylic acid	156,201	81,537
	100 International units	100 International units
Insulin	1,060,645	1,231,807
	Mega units	Mega units
Penicillin	881,084	314,672
Total value of drugs, medicines and preparations	£1,608,853	£1,359,848
Total value of dyes and dyestuffs	£585,563	£578,118
	Cwt.	Cwt.
Plastic materials	36,607	41,562
Value	£437,178	£476,648
	Cwt.	Cwt.
Chemical glassware	1,240	1,506
Value	£48,643	£44,276
	Cwt.	Tons
Fans	5,703	185
Value	£138,199	£121,267
	Cwt.	Tons
Furnace plant	6,244	361
Value	£85,446	£68,976
	Cwt.	Tons
Gas and chemical machinery	26,565	1,067
Value	£307,633	£250,597

IMPORTS

	Oct. 1949	Oct. 1948
	Cwt.	Cwt.
Acetic acid	—	21,962
Boric acid	2,801	1,000
All other sorts of acid	1,527	4,107
Borax	14,400	9,900
Calcium carbide	—	67,373
Coal tar products (excluding benzol and cresolic acid)	—	14,511
Cobalt oxides	271	742
	Tons	Tons
Arsenic	—	422
Fertilisers	35	13,631
	Lb.	Lb.
Iodine	—	67,058
	Cwt.	Cwt.
Potassium chloride	767,165	841,273
Potassium sulphate	78,200	12,800
All other potassium compounds	2,868	4,008
Sodium nitrate	99,530	79,760
All other sodium compounds	4,741	2,605
Carbon blacks (from natural gas)	41,116	60,671
Total value of chemicals, drugs, dyes and colours	£2,003,915	£2,599,628

MANCHESTER PIONEERS

The Growth of Chemical Industry

EARLY pioneering achievements in the production of salt and sulphuric acid were really only a preliminary to greater things. The real beginning of the chemical industry in the Manchester district was the Le Blanc process for soda production, first carried out at Liverpool and later at St. Helens.

Rudimentary development of chemicals was carried on in crude efforts to make the heavy acids, soda, bleach and soap, some tar products and simple natural colours for textiles.

These were cited as among the milestones in the growth of the chemical industry in the Manchester district, described by Mr. N. Swindin in a paper presented to a meeting of the Institution of Chemical Engineers (North-Western branch), held in Manchester last week.

He recalled that in 1836 Gossage's absorption tower added hydrochloric acid to the list of heavy chemicals. Bleach was made by Tennant and by Henry Deacon (1822-77), who, among other processes, invented the first catalytic process of manufacture of chlorine from hydrochloric acid.

In 1891, Hamilton Young Castner, a young American chemist who had come to England in 1886, developed a process for the isolation of sodium by the electrolysis of brine and with Kellner, an Austrian interested in the same problem, established the Castner-Kellner process at Weston Point.

A tribute to the ability of William Hesketh Lever, a genius of business organisation, was paid by Mr. Swindin, who also referred to Ivan Levinstein, who, when only 19 years of age, established a works at Blackley to manufacture dyes; thus Clayton Aniline was established in 1876.

Some details were given of the work of George E. Davis and of Professor Osborne Reynolds.

S. Porter & Co., Ltd.

Attention of users of chemical leadwork is directed to the fact that S. Porter & Co., Ltd. (associated with Nordac, Ltd.), established supplier in this field, is continuing to operate at Dukes Road, Western Avenue, London, W.3 (telephone Acorn 2289).

The company's advertisement (THE CHEMICAL AGE, 61, xvi) gave inadvertently the address which will be occupied early next year.

UNJUSTIFIED ATTACK

Impediments to Export Enterprise

IT is impossible to pick up every sneer that now comes from high places—writes Sir Ernest Benn—but a remark of the Prime Minister at the Lord Mayor's Banquet should be challenged. The habit of attributing slackness to our business men is spreading and the cruel injustice of it can hardly be appreciated except by its victims. Mr. Attlee spoke of "North American buyers hunting through our markets and meeting with little response except circumstantial accounts of order books filled with business from the home market and soft currency territories."

A typical circumstantial account would relate how months have been wasted securing the necessary permits and materials for an order for some old customer on the Continent, how the order was halfway through and would take another few months to complete.

The Alternative

The lay reader is unlikely to appreciate the position. The Prime Minister's outrageous suggestion is that such a manufacturer should cancel his contract for the Continent, render himself liable to all sorts of penalties for failing to comply with licences already granted, stop the order halfway through and start again on the weary process of persuading the Board of Trade that the necessary permissions for an American order should be granted.

All that the business man can do is to shrug his shoulders and get on with the job, lacking almost all incentive and any sort of encouragement.

Nuclear Physics Talks

A CONFERENCE of the Physical Society will be held in the Physical Department, University of Birmingham, Edgbaston, on December 10, 9.30 a.m. to 4.30 p.m., when a series of papers on nuclear physics will be discussed.

In the morning session G. F. J. Garlick will speak on "Crystals for Scintillation Counters," and Prof. R. E. Peierts on "Speculations about the Origin of the Elements."

"Life-times of Excited Nuclear States," will be the subject of the first paper in the afternoon session by Mr. D. E. Bunyan, who will be followed by Dr. J. Lindhard, speaking on "The Shell Models of Nuclear Structure."

CHEMISTRY AND BUILDING TECHNIQUE

Representative Exhibits at Olympia Exhibition

THE work of the chemist and metallurgist in producing new and better materials, equipment, and processes in connection with domestic and industrial building is exemplified in many of the exhibits at the 23rd Building Exhibition, which opened at Olympia (London) on November 17 and continues until December 1. There has been a good attendance of potential buyers from overseas and many others have signified their attention of visiting the exhibition.

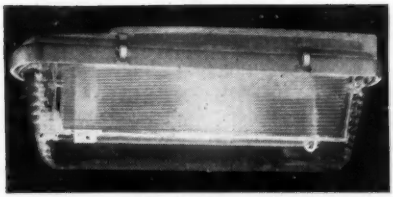
The recognised need for special treatment of stone, concrete and cement surfaces intended for heavy duty, to make them harder, and more water- and weatherproof, is claimed to have been met by the range of solutions shown by Silicaseal, Ltd. Ethyl silicate forms the base of these products, which are essentially colloidal solutions of silica in alcohol and in application leave a "glue" of silica which hardens to a glass-like consistency.

The exhibit of Dohm, Ltd., includes examples of a wide range of powdered raw materials for many industries, among them exfoliated vermiculite, which, besides being used in building as a featherweight aggregate and insulating material, is finding increasing application as a packing material in place of wood wool and sawdust. The last is increasing, especially in connection with the packing of laboratory equipment and fragile glassware generally. It is chemically inert, and has already been used in America for packing eggs for transport over long distances. A new plant for the exfoliating of vermiculite has just been established by the associated firm of Logan, Sons & Co., Ltd., 163 West George Street, Glasgow.

Paint and Plastics

The I.C.I. display serves to reveal the wideness of the range of building materials produced by its paints, plastics, metals and Billingham (cement) divisions. A conspicuous trend is the growing use of corrugated Perspex for roof lighting and of Perspex generally in domestic fittings, including wash basins and other kitchen and bathroom units.

The plastics section of this exhibit also shows Alkathene tubing for plumbing services, PVC coated fabrics for upholstery and flooring, Nylon paint brushes, and Nuron laminated boards. Perspex is finding a new and promising use in electric lighting installations, especially for street lamps, in which the "dish" of the lantern and the refractor plates are made of it.



[Courtesy, General Electric Co., Ltd

Street lantern for sodium lamps, with dish and refractor plates of Perspex

The I.C.I. metals division exhibit focuses attention on the many uses of non-ferrous metal products in building construction. Prefabricated copper panels for roofing are shown, and the easy assembly and neatness of a copper tube installation is demonstrated by the display of a plumbing assembly utilising light gauge copper tubes and fittings of the compression and capillary type.

A general illustration of the use of non-ferrous metals in building construction is provided by the exhibits of the Zinc Development Association, the Lead Industries Development Council, and the Copper Development Association.

On the stand of the Zinc Alloy Rust Proofing Co, Ltd., are examples of architectural ironwork rust-proofed by the Sheradizing process, which is essentially a low temperature heat treatment.

The Fire Protection Association's stand is a reception centre for architects, builders and others, where advice is given on all phases of fire protection and prevention in relation to domestic and commercial buildings and building materials. The scientific processes involved in the various recommended methods are those developed in collaboration with the DSIR.

The exhibit of the DSIR includes pictures of metal pipes which have become corroded in various soils in which they had been buried, and literature is obtainable on recommended methods of corrosion prevention, including the galvanic protection of metals subject to corrosion in aqueous media.

Growth of Support for Scientific Films

Aid for Research Workers Planned at Brussels

by STANLEY W. BOWLER, F.R.P.S., F.R.S.A.

THE growing awareness of the scope of the scientific film in education and research work may be indicated by the fact that 32 nations sent delegations or observers to the third congress of the International Scientific Film Association, recently held in Brussels.

The delegation from Britain, which was the largest, consisted of 14 members of the Scientific Film Association of Great Britain, and included representatives of the Royal Photographic Society, the Royal Society of Medicine, the Scottish Film Council, and observers from the British Council and the B.B.C. Television Service.

The largest theatre of the Palais des Beaux-Arts seats about 2500 people and it was packed for the first public showing of general interest films, at which the Queen Mother of the Belgians was present. Of the 150 films shown during the congress Great Britain submitted 18.

A Russian Film

On the second evening, a programme of films on scientific research was given, and among these was one from the U.S.S.R., in colour, entitled " The World of Crystals." The film contained scenes of crystals of many kinds, including sequences of growing crystals with the most brilliant hues, and might well serve to intensify interest among students in this field of chemistry.

Films at other sessions showed brilliant examples of cinemicrography and other difficult techniques. Two special sessions were devoted entirely to medicine and surgery, media for which the use of cinematography is most advanced.

Two sessions of the congress were devoted to industrial films, and at the first of these Shell's " Pattern for Chemicals " was shown. This film is particularly interesting for its treatment of molecular symbols in model form. The unusual introduction of hands in stylised positions to point the changes in molecular grouping aroused some discussion. At the second session a short 16 mm. film in colour, " The Nature of Plastics " (THE CHEMICAL AGE, *60*, 536) was screened. Films of this kind are sufficiently popular in appeal to play an important part in bringing to general notice the important part which chemicals play in daily life.

The proportion of films dealing with chemistry was low, probably due to the reluctance of many research associations or manufacturers to release information to the general public.

At the proceedings of the general assembly it was agreed to set up three new groups, one of which is to deal with the use of cinematography in pure science and research. It is hoped during the next year to begin documenting on an international scale the work in this field, by collecting the names and special interests of research workers using film, and also to build up a reference library of information about existing research films and film records, specialised techniques, etc. At a later stage it may be possible to publish the results of this survey so that a research worker in one country can communicate with a fellow worker in another. It is also hoped that the documentation of film techniques may provide assistance to the " lone worker " who needs some particular information to enable him to proceed with a task.

The next congress of the association is now being planned and it is hoped that it will take place in Milan, a convenient university and industrial centre, towards the end of September 1950.

Isotopes by Air

A METHOD of facilitating the transport of radioactive isotopes by aircraft is reported to have been devised for the use of South African Airways.

One of the main problems has been to provide shielding without the heavy lead casing normally required. In the new method the isotopes are enclosed in small metal containers which can be housed remotely in the wings of the aircraft.

The containers have rings so that they may be handled by long rods. When in position in the wing tips the isotopes are said to have no effect on crew, passengers or even sensitive photographic plates carried in the machine.

Before such containers can be used, permission of all the countries on the route to Johannesburg would have to be obtained.

SOLID FUEL AND BUILDING LAYOUT

Minimising Manual Work in Handling *

by J. B. PINCKHEARD, A.R.I.B.A.

THE design of solid-fuel storage arrangements plays an important part in providing efficient technical services in buildings.

The object of fuel storage is, of course, to provide a reserve which will enable heating and other installations to continue working over a reasonable period without the necessity for frequent small deliveries. Important factors to be borne in mind are the type of boiler plant, means of access and methods of delivery and stacking both within the building and in the open air. The chemical and physical properties of solid fuel are considered also so far as they affect the planning and design of storage arrangements.

For general guidance it may be said that provision of storage capacity equal to four weeks' peak-load requirements should be the minimum aim in all new buildings. With factories this figure should be increased if possible to six weeks. It will frequently be possible, *e.g.*, in buildings on open sites, to provide accommodation considerably in excess of these figures. On the other hand, with buildings in densely built-up areas with high site values it may be extremely difficult always to satisfy this suggested minimum, and the pressure of other accommodation may compel some relaxation in the storage requirements.

Bulk Problems

The space required, weight for weight, by different types of fuel varies widely; coke, for example, requires roughly twice as much space as the same weight of coal. Table 1 gives the bulk densities of three different solid fuels and their approximate calorific values expressed as therms per cu. ft.

TABLE 1.—BULK DENSITIES AND CALORIFIC VALUES OF DIFFERENT FUELS

Type of fuel	Cu. ft. per ton	Lb. per cu. ft.	B.Th.U. per lb.	Therms per cu. ft.
(1)	(2)	(3)	(4)	(5)
Anthracite ...	41–37	55–60	14,500	8.0–8.7
Bituminous coal	45–41	50–55	12,000	6.0–6.6
Coke	100–90	22–25	12,000	2.7–3.0

Apart from the question of spontaneous combustion, which cannot be considered a serious risk in stocks of less than 200 tons, coal does suffer some deterioration, whether stored in the open or under cover. The deterioration is considerably less in extent than is commonly supposed, and it may be either chemical or physical.

Chemical deterioration takes the form of loss of calorific value due to slow surface oxidation accompanied by loss of coking power. Physical deterioration occurs as the formation of fines by disintegration, or the loss of calorific value due to increase in moisture.

Disintegration

The loss in calorific value due to oxidation varies with the type of coal stored, being greater for bituminous coals than for anthracite. It rarely exceeds 1 per cent, which is less than the variation in the efficiency of utilisation. Chemical deterioration occurs almost wholly in the first 6 to 12 months of storage. Once this period has elapsed stacks should be maintained undisturbed as long as possible, as subsequent deterioration is negligible. Conversely, deliveries of fresh coal should be consumed with the least possible delay, to avoid prolonged atmospheric exposure.

The amount of physical disintegration which occurs is dependent both on the type of coal and on the season, being greater in winter (owing to frost) than in summer. Disintegration may be a disadvantage where sized coal is being used, since the fines are liable to fall unburnt through the grate. Weathering is only one of a number of causes of the production of fines. They are produced every time coal is handled, and certainly by the practice of filling road vehicles by dropping coal from rail wagons at high level. There is no evidence that the proportion of fines is seriously increased by storage compared with the degradation due to normal handling.

The increase in surface moisture content of coal stored in the open may, in bad weather, be as much as 10 per cent, and the fuel required for driving off this moisture in the furnace will lead to a decrease in effective heat generation of about 1 per cent. On the other hand, damping sometimes improves the efficiency of combustion of certain coals.

It will be clear from the foregoing that the deterioration of coal in storage, both physical and chemical, is not serious in comparison with losses from other causes,

* Abstracted from a paper delivered in London this week to the Institute of Fuel.—"The Storage of Fuel in Relation to Buildings."

and that its total effect is not likely to exceed 2 per cent of the calorific value. Furthermore, much of the deterioration occurs irrespective of whether the coal is stored under cover or in the open air.

There is no evidence to justify the provision of extensive covered storage space for reserve coal stocks, for the capital cost of such accommodation would considerably outweigh the doubtful small savings which might be achieved in running costs.

[The paper notes that spontaneous combustion, arising from oxidation, occurs only in large stacks of coal and is seldom experienced in stacks of less than 200 tons. Coal of uniform size rarely causes trouble, and the majority of cases of spontaneous combustion can be traced to the mixture of fines with larger coal.]

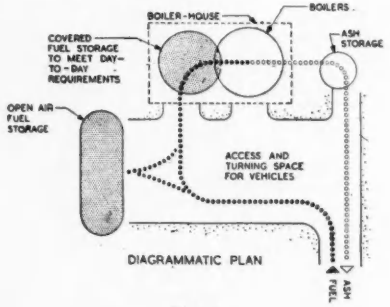


Fig. 1

It was for long believed that wet coal was more liable to oxidation than dry, but this is not the case. The risk of spontaneous combustion is greater with the increase in height of the stack. Freshly mined bituminous coals should not be stacked higher than 8 ft., although in some types and sizes stacks are permissible up to 16 ft., and anthracite may be safely stacked up to 30 ft. high. Ventilation is the most effective preventive measure.

Unlike coal, coke is not subject to chemical deterioration, and can be stored in large quantities without special precautions. There may be some increase in moisture content during storage, and disintegration may occur with consequent formation of fines, particularly if the coke is exposed to heavy frost.

For large buildings situated on open sites requiring the maintenance of considerable stocks of fuel, open-air storage is normally the most economical arrangement. In addition, covered storage sufficient for, say, a week's supply, must be planned in conjunction with the boiler-house to provide for immediate requirements. The outdoor storage provides a reserve from which the covered store can be replenished when required.

Deliveries of coal should be made to the store serving current requirements and not to the open store, where each fresh delivery would be successively exposed to the effects of atmosphere and weather. The reserve fuel once laid down should be disturbed as little as possible and may well remain for several years. Fig. 1 illustrates diagrammatically the flow of coal through the storage accommodation.

The planning of fuel storage accommodation in buildings, particularly in densely built-up areas, is usually much more involved than the provision of storage on an open site.

Certain objectives should be kept in mind. First, suitable access for deliveries; secondly, reduction in the amount of manual handling needed; and thirdly, the fullest use of the available storage space.

Means of Transfer

The transfer of fuel from bunkers to boiler may be achieved manually, by mechanical means, by gravity or by a combination of two or more of these methods. A gravity feed system is obviously the cheapest to run, but it requires careful planning of the levels of the boiler room and the fuel store.

In urban buildings, quite apart from consideration of fuel storage there are good reasons for keeping the boiler room at basement or even sub-basement level. Where this is done there should be little difficulty in ensuring the gravity-assisted movement of fuel (Figs. 2 and 3).

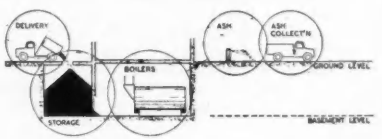


Fig. 2

In building on open sites, where heating chambers or boiler houses are more likely to be planned at ground level, it is not easy to arrange for gravity feed. There is also the problem of how to store the fuel compactly. Using ordinary methods of delivery the height of the stack cannot be increased, without hand trimming, beyond 4 ft. 6 in. A given quantity of fuel spreads over a greater area, therefore, than it would in an urban building

with comparable requirements. In addition, longer runs are involved when barrowing fuel from the stack to the heating chamber.

If in a particular building there are good reasons why the heating chamber should not be sunk below ground level, consideration should be given to the possibility of delivering fuel to a point sufficiently elevated above ground level to permit gravity feed. This may be achieved by the use of a ramped access road, and occasionally by taking advantage of a sloping site.

A third possibility, as yet almost unknown in this country, is the use of mobile handling equipment carried by the delivery vehicle, with the aid of which the coal merchant would deliver to an elevated store.

Bunkers should be planned so that they can be readily filled and emptied and so that fuel flows by gravity from a filling opening at the top to an outlet at the base. They should be so designed that undue segregation does not occur, either in filling or during the passage of the fuel through the bunker.

Particularly in urban buildings it is important to plan the bunkers so that the potential storage space available is fully utilised. Bunkers should always be provided with access doors or manholes so that fuel can be trimmed.

Segregation can be prevented to some extent by proper design of the bunkers. Segregation occurs particularly when coal is dropped from a height in such a way that it forms a conical heap of progressively increasing size.

This can be obviated partly by limiting the distance which coal drops when it is fed into the bunker, and for this reason very deep bunkers should be avoided unless there are means of breaking the fall of the coal. A depth of 10 ft. is suitable. Also the openings should be arranged so that there is not a tendency for single large cones to form. For this reason a larger number of more closely spaced openings is preferable to a single one.

Problems of Segregation

Segregation occurs also during the emptying of the bunker when craters develop over the outlets, and again the larger coal tends to roll to the bottom. This effect can similarly be mitigated by having a larger number of openings through which the fuel is discharged, so that the level of the stored coal is lowered evenly without the formation of large craters.

Internal vertical divisions within the bunkers are an advantage in this respect, but are open to the objection that they obstruct the shifting of fuel from one section of the bunker to another.

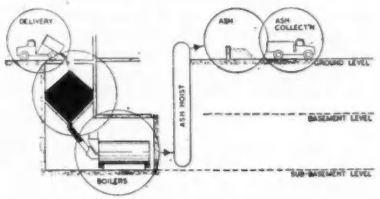


Fig. 3

With bunkers which are filled through fuel openings in the top it is always difficult without hand-trimming to ensure that the space is properly filled. With a single opening a cone of fuel is formed, the corners of the bunker being left unfilled. The bunker can be much more effectively utilised if the number of openings is larger.

Bunker Design

It is quite usual with bunkers in industrial buildings to leave the tops open except for a metal grille capable of sustaining the weight of vehicles, the mesh being determined by the size grading of the fuel used. With this arrangement there is no difficulty in completely filling the bunker, and segregation is minimised.

Where bunkers are designed to be self-emptying the bottoms should slope at an angle of not less than 45° with the horizontal. An angle with the horizontal of 35° will be sufficient to keep fuel in motion which is being discharged on to an an inclined chute—as, for example, from a delivery vehicle. The minimum cross-section of such a chute should not be less than 10 times, and preferably 20 times, the size grading of the fuel.

Bunkers should always be provided with access doors or manholes so that fuel can be trimmed. Care should be taken to see that the bunkers are not traversed by service pipes, cables or ducts.

The openings through which the fuel is shot into a building should be designed in relation to the types of delivery vehicles used by the merchants. The one most used for bulk solid-fuel deliveries is the end-tipping lorry. Dimensions relating to a typical delivery vehicle are given.

A 5-ton load of coal will occupy approximately 200 cu. ft., and so a 5-ton short-wheelbase tipper with a body measuring internally 6 ft. 9 in. wide by 8 ft. 6 in. long

will require sides 3 ft. 6 in. high. This is higher than normally provided by the makers but extension sides are, in fact, often added by the merchant to permit a full load to be carried.

Coke presents a special transport problem since for a given weight it has twice the bulk of coal. The 5-ton short-wheelbase tipper referred to above is less suitable for carrying coke, since no reasonable increase in the height of the sides can possibly provide the capacity necessary for a full pay load. It is for this reason that bulk coke deliveries are more economically made by the long-wheelbase lorry. This requires greater headroom when elevated.

A specialised type of vehicle which has been used to a limited extent is the rolling-floor lorry, the floor of which consists of an endless band of rubber. To discharge the load the roller at the forward end of the body is rotated manually through suitable gearing, causing the endless band to move backward and eject the contents from the rear end of the lorry.

This type of vehicle is specially suited to delivering fuel into vertical openings, since it can discharge into a much smaller aperture than is required by a tipper; further, it requires no more headroom than an ordinary lorry.

In the U.S.A. the problem of solid-fuel delivery has received more consideration than in this country, and a relatively large number of specialised solid-fuel delivery vehicles has been developed.

A widely used type is the tipper supplemented by a light elevator conveyor, carried as part of the vehicle equipment and operated hydraulically from the engine.

The great advantage of this type of equipment is that delivery can be made to a number of points beyond the reach of an ordinary tipper. Fuel can be discharged at a height normally inaccessible and also within an appreciable horizontal radius from the rear of the lorry.

Illustrations are reproduced by courtesy of the Coal Utilisation Council.

Wartime Research Reports

THE release of substantial amounts of technical information for industries is foreshadowed in an announcement by the Board of Trade concerning the programme of making available the results of wartime research, the first effect of which has been the issue of a new technical work on paints.

Most of this work performed during the war at Government centres, universities, and in private laboratories had a direct bearing on the war effort and for obvious reasons could not be publicly disclosed at the time. It is realised, however, that many of the results might be used with advantage to further the drive for greater productivity.

The large quantity of material produced is now being sifted with the object of selecting and publishing those reports considered to be of primary interest to industry or of value to research scientists.

Volume 2, on "Paints" (HMSO, 5s. 3d. post paid) contains eight reports. Three are concerned with the protection of magnesium alloys. Other subjects include the use of ground flax shives; surface treatment of brass; uses of blood albumen; and the determination of the viscosity of paints.

(*continued at foot of next column*)

Monsanto Tar Distillery Closing

THE reasons for the decision by Monsanto Chemicals, Ltd., to discontinue operations at its tar distillation plant at Sunderland are given in a statement by the chairman, Mr. E. A. O'Neal, jun. The lease of the property, which is owned by the River Wear Commissioners, expires on December 31, 1950, and the commissioners were informed last week that a new lease would not be applied for.

The works, states Mr. O'Neal, are no longer needed by the company as a source of raw material supplies for the other factories, and conditions have made tar distilling for Monsanto's purposes uneconomic at this site. Other secondary manufacturing operations are being transferred.

In the conditions now governing the production of tar, the works is considered not likely to be of interest as a tar distilling plant to any private enterprise. The site has, however, possibilities in other manufacturing directions and possesses valuable dock and effluent facilities.

Other titles in this series will include: 1, Plastics; 3, Protection and Electrodeposition of Metals; 4, Textiles and their Testing; 5, Servomechanisms; 6, Strength and Testing of Materials; 7, Adhesives; 8, Wood; 9, Powder Metallurgy.

ARTIFICIAL WEATHERING EQUIPMENT

Some Defects of Current Paint Test Methods

PAINT materials and paint technology have increased in number and complexity far more quickly than has some of the testing equipment. That conclusion was implicit in the paper presented last week before the London Section of the Oil and Colour Chemists' Association by Mr. P. J. Gay, of the Paint Research Station (DSIR) at Teddington. He dealt with simulated weathering processes, "accelerated weathering, so-called," making evident that among the defects of existing equipment the absence of any exact reproduction of effects of natural oxidation was one calling for attention.

Mr. Gay reviewed briefly the history of accelerated weathering at the DSIR research station and discussed the apparatus used originally. The outstanding point now emerging from the data, he said, was the rather poor correlation obtained between the mode of breakdown (as distinct from the rate of breakdown) in accelerated and natural weathering. In accelerated weathering there was a high probability that film breakdown with practically all types of finish in white, pale shades and some darker colours would take the form of intense chalking—a phenomenon not in accord with natural exposure results in this country. On the other hand, many dark-coloured finishes did not show any characteristic breakdown in even long periods of accelerated weathering.

Irregular Results

The typical forms of checking, cracking and flaking so frequently observed in practical paint failures were rarely observed in the accelerated weathering of gloss paints and hard finishes, which now formed the main class of materials to be tested. Accelerated weathering, therefore, in its present form could not be used to predict the type of failure likely to occur on natural exposure. He presented a table summarising the results obtained over a number of years with a wide range of finishes, which bore out the irregularity of results.

In the present state of development, accelerated weathering had clearly serious limitations as the sole test of assessing the durability and mode of breakdown of paints and varnishes. Thus, it would be relatively easy to prepare paints which would show a higher level of performance under accelerated weathering than would be anticipated from their exterior durability. However, the significance of those limitations should not be overstressed, since accelerated weathering performance was never likely to be the sole criterion on which the merits of a finish would be decided.

Mr. Gay, earlier, had reviewed the comparatively recent origin and the behaviour of artificial weathering appliances. The work of Nelson and of other American investigators between 1922 and 1930, he said, had determined the general pattern of the great majority of types of accelerated weathering apparatus until the present.

Types of Apparatus

The usual arrangement was a cylindrical tank revolving slowly about a vertical axis and with the specimens under test arranged around the perimeter. Suspended in the tank was a source of ultra-violet radiation and a means of wetting the paint surfaces. The apparatus was covered by a loose-fitting lid.

There were great differences in the sources of ultra-violet light. Nelson preferred a mercury arc, probably because it was the strongest source of ultra-violet light, but most opinion preferred the carbon arc which, though poorer in ultra-violet, was more constant in performance. In this country the carbon arc was used almost universally, but there was no agreement as to type and intensity.

There had also been variations in the manner of wetting the test specimens, but it had not been the custom to measure or control temperatures in the apparatus.

In 1947, when it became necessary to reconstruct the accelerated weathering equipment at the Paint Research Station, the whole matter of design was considered in the light of experience and likely future trends of the work. The general geometry and mechanical arrangements of the old apparatus were duplicated in the new. The design was modified to allow for more uniform distribution of the water spray, variation in the periods of irradiation and water treatment, elimination of ultra-violet irradiation during a part, at least, of the water treatment, and variation of the speed of the cycle to allow for greater amplitude in variation of film water content, etc.

Mr. Gay discussed some recent results. Regarding the status of simple water

spray-arc lamp cycles, the work described was in general accord with much published work, but served to stress that the results of such cycles did not duplicate the type of breakdown obtained outdoors and did not always correlate with natural exposure results as regards overall rate of breakdown. While such test cycles could serve a useful purpose, particularly in development work, it was necessary to use a measure of caution in interpreting the results, particularly with new types of finish, where no background knowledge of natural weathering behaviour was available.

No case appeared to exist for increasing the level of ultra-violet radiation above that emitted by an enclosed carbon arc dissipating about 1 kW across the carbons. There was need, however, to control and measure the actual ultra-violet output to ensure reproducibility.

Secondly, Mr. Gay discussed the mechanism of weathering and its bearing on equipment design. The general work on weathering at the research station over many years had led to the hypothesis of two parallel factors, (1) the progressive destruction of the flexible structure of the freshly-dried film with the formation of a relatively hard brittle structure, probably by chemical reaction; (2) the failure of the weathered structure under the stresses set up by the weathering agencies, primarily temperature changes and water treatment.

Balancing the Agents

The main problem in the design of a satisfactory accelerated weathering cycle was to obtain the correct balance of intensity between the various weathering agencies so that overall breakdown was accelerated without distorting its form. The present work indicated that in the present weathering cycles film oxidation was the rate-controlling step, set by the almost universal use of an oxygen partial pressure of about 160 mms. Hg. in accelerated weathering equipment.

In the presence of that rate barrier manipulation of the other variables produced only small effects, but once that barrier had been removed by the use of higher oxygen pressures it was conceivable that the other weathering agencies would then become more critical and further progress might be made by the adjustment of those in turn.

There was some promise that ultimately a correct balance might be struck between the various weathering factors and a really close correlation with natural exposure obtained. It was conceivable, however, that no single set of conditions would prove finally satisfactory in relation to the large number of types of compositions to be tested and the variability of natural exposure conditions. The final refinements might therefore be the development of a number of specialised cycles employing different relative intensity levels of the weathering factors in the same apparatus to simulate the natural weathering of specific types of paint under defined climatic conditions.

An Improved Cycle

That final stage would be reached only after much further work, but it appeared, if the present work on the oxygen pressure factor developed favourably, that a cycle involving oxygen treatment could be put forward in the relatively near future which would overcome to a marked extent the present discrepancies between the mode of breakdown observed in accelerated and natural weathering.

No substantial change was visualised in that cycle so far as light and water treatment were concerned, for major improvements were unlikely to be achieved by the simple manipulation of those variables, although the use of a still slower cycle than one revolution per hour needed further experimental examination.

As soon as possible, said Mr. Gay, agreement would have to be reached on details of apparatus and operating conditions, if accelerated weathering were to be used generally as a routine test. The urgency of that requirement was such that agreement now in the present state of knowledge was more important than the attainment of perfection years ahead.

New Impact Test?

MONSIEUR Henri M. Schnadt, a Belgian engineer, well known on the Continent as the originator of a new system of impact testing which he proposes, has accepted an invitation to visit this country to address (in English) a meeting, on November 30, of the the Institute of Welding at the Institution of Civil Engineers, Great George Street, London, S.W.1, at 6 p.m.

While Monsieur Schnadt's theories are still the subject of lively controversy, his testing technique is stated to be finding increasing application in the Continental steel using and producing industries. From the point of view of the welding engineer, the Schnadt test offers certain advantages as an impact test permitting the testing of weld metal and heat-affected zone separately.

GLASS-TO-METAL SEALS

*Development of the Iron-Nickel-Cobalt Alloys**

PROBLEMS in the production of a satisfactory glass-to-metal seal involve the consideration not only of the nature of glass but also certain properties common to both glasses and metals.

Glass differs fundamentally from metal inasmuch as it does not solidify at a definite temperature nor in crystalline form.

Glasses intended for glass-metal seals are loosely divided into two categories—soft glasses (soda lime and lead) worked in the range 800°-1000° C., and hard glasses (boro-silicates) worked in the range 1000°-1300°C. The thermal expansion coefficients of soft glasses in the 0°-300° C. temperature range are from 80 to 105 by 10^{-7} per degree C., and those of the hard glasses range from 30 to 50 by 10^{-7}.

Certain properties of the various glasses are important in deciding whether they are suitable for glass-metal seals but the coefficient of thermal expansion is the only one of direct interest. As a rough gauge in choosing glasses to match a particular metal it may be said that the difference in expansion coefficient between glass and metal should not exceed 10 by 10^{-7} per degree C., although this need not be true for certain external seals and is never true for thin edge, thin edge tubular, internal thin walled tube and certain ribbon seals.

Zero Stress

The ideal relationship in the case where zero stress is required would be for the expansion curves for both glass and metal to coincide over the entire temperature range to the softening point of the glass, but this is never wholly achieved. The proximity of the metal and glass expansion curves at any temperature is governed by the rate of heating or cooling of the seal and the stresses in the glass in such a seal may be varied, in many instances, by the thermal treatment to which the seal is subjected.

It is difficult to estimate from purely thermal expansion measurements, what stresses will occur in the finished seal. Such stresses are best determined by photo-elastic methods.

In the earliest known examples of glass-to-metal seals the problem was overcome only by using fine gauge wire so that the expansion differences were minimised and stresses accordingly reduced. Seals to thick sections of metal could not be made.

This was the position up to the latter part of the 19th century when it was found possible to produce a glass that could be sealed direct to platinum sheet or wire without great difficulty.

The cost of platinum made the necessity for an alternative material of prime importance and eventually it was found that nickel-iron alloy thinly coated with copper, and known as Dumet, fulfilled the requirements to a large extent.

Iron-Nickel-Cobalt Alloys

The problem of making satisfactory seals was only partially solved, for Dumet could only be used in wire form, and then not thicker than .04 in.

Development of the iron-nickel-cobalt alloys (Nilo K) has largely satisfied these requirements.

This iron-nickel-cobalt alloy is polymorphic and has an alpha or body-centred form, which has a high coefficint of expansion and a gamma or face-centred cubic form, which has a low coefficient of expansion. For the temperature range 25°-450° C. the coefficient of the gamma phase is 47 by 10^{-7}. The transformation to the alpha phase does not occur at temperatures above 80° C. The gamma phase can be restored by a short anneal. Oxidation occurs at about 650° C.

The operations involved in making glass-to-metal seals are fairly simple in the case of wire seals, which are usually below 2.5 mm. diameter. Production of the larger cylindrical seals, is more difficult and necessitates more elaborate methods. In both cases, however, the glass and metal must be brought into intimate contact at a tmperature high enough for the glass to be fluid. The temperature of the metal generally equals or exceeds that of the glass.

Oxide forms on all sealing metals other than perhaps the noble metals, owing to the heating needed to soften the glass. Some authorities claim an oxide film is essential to obtain a gas-tight seal, but this is disputed.

The colour of the film formed offers a useful indication that a good seal has been obtained. In the case of molybdenum a

* Abstracted from "Glass-to-Metal Seals," newly issued by Henry Wiggin & Co., Ltd., Birmingham.

chocolate brown colour denotes the formation of a suitable oxide. Copper coated nickel-iron alloy gives a bright red. Tungsten is usually a pale straw. Prebeading technique for Nilo K will produce a colour which may vary between grey and chocolate, depending upon the technique employed.

Nilo K has great advantages over other sealing metals in that no great skill is required either in preparing the seal or in its actual manufacture. De-gassing is necessary before use, but this can be simply carried out by heating up to at least 950° C. for about 20 minutes in an atmosphere of wet hydrogen.

Fabrication of the metal presents few difficulties. Spinning is practicable, but not easy, and frequent annealings are necessary. In the case of a 1 mm. Nilo K sheet spun to a depth of $\frac{3}{4}$ in. with a diameter of 30 mm. brazing or soldering to other metals involves no trouble if the areas to be joined are free from rough edges and grease of any sort.

It is difficult to estimate the stresses in many types of glass-to-metal seals, because corrections are necessary for differential cooling of glass and metal, viscous flow of glass during cooling and changes in properties of glass through heat-treatment, while the exact temperature of retention of strain in glass can greatly modify the results obtained theoretically. Direct polariscope determinations of strain are the most reliable.

A great deal of work on the subject of stresses in glass-to-metal seals has been carried out in recent years and the extent of the knowledge now available is probably far greater than many producers and users of seals appreciate.

The company acknowledges the co-operation of J. E. Stanworth and W. J. Scott of the British Thomson-Houston Co., Ltd., Rugby, and P. E. Cane of the Edison-Swan Electric Co., Ltd., Ponder's End, in preparing the article.

Indian Oilseeds and Plastics Projects

THE movement in India to build up home chemical industries and become more independent of outside sources has markedly increased, in evidence of which is further news of projects or recommendations for development and research being planned or put in hand.

One such enterprise on which much attention has centred is the research work now being carried out at the Loyola College laboratory, Madras, under the Rev. Fr. Lourdu Yeddanapalli, professor of chemistry, for the manufacture of plastic material from oil obtained from cashew nuts.

Plans to establish a central factory and make the Indian plastic industry independent of foreign aid as proposed by the conference of All-India Plastic Manufacturers received encouraging support from the delegation headed by Mr. B. D. Garware which recently returned from visiting Great Britain and the U.S.A.

Measures to increase the production of oilseeds, improvement of marketing and distribution methods and promotion of export trade in the commodity were the principal items discussed at the fifth meeting of the Indian oilseeds committee at New Delhi. Sardar Datar Singh, vice-chairman of the Indian Council of Agricultural Research, pointed out that India's export trade in oilseeds, which used to earn considerable foreign exchange, had been decreasing for some time, and in 1948-49 the total export amounted to only 200,000 tons as against about 800,000 to 1 million tons during the pre-war period. The fundamental factor responsible for reduction of exports, he said, was the high price of Indian oilseeds, which was due to some extent to unregulated speculative activities.

The committee approved a change proposed in the present method of exporting oilseeds. Until early this year, when the export of Indian oilseeds was governed by the allocation from the International Emergency Food Council, export had to be arranged through established shippers.

With the abolition of international allocation, the export promotion committee felt that exporting should be thrown open to all shippers after fixing a quota for the year. The recommendation to allow free inter-Provincial movement of oilseeds was also accepted.

Various research schemes for increasing the quantitative yield of oilseeds by improved methods of seed multiplication were approved by the committee.

The Government of India has finally decided that the location of its first steel plant shall be in the Central Provinces. The factory will be situated at Bhilai in the Drug district.

In his report to the Government of India, the American consultant, Mr. Denis, who visited Bhilai, estimated the cost of the proposed plant at $100 million.

CEMENT AND CHEMICAL PRODUCTS

French Study of Combined Operations

THE possibility of combining cement manufacture with that of other important products has long been well recognised, and to some extent realised. In a recent paper on the subject read before the Conservatoire National des Arts et Metiers, in France, Prof. H. Lafuma described some further developments in this direction (Chim. et Ind., 1949, *62* (9), 249-253).

One of the best known of the combined operations is that which relates to the manufacture of cement with that of sulphuric acid, following the ideas of Basset, with gypsum, etc., a method that was developed in Germany before and during the war by the I. G. Farbenindustrie, by Imperial Chemical Industries, Ltd., in England, and in France at Miramas. A modified form of the process was adopted in Spain, at Moncada, and by the d'Alhandra works in Portugal.

These and others similar have been described by M. Zorninger in a paper read before the Centre du Perfectionnement Technique, in 1941, and summarised by Lafuma. They involved various difficulties which, to some degree, can be avoided by envisaging not a simultaneous working, but working in series with one product at a time. Lafuma calls these " Fabrication Liées."

Two or three products may result, from double or triple " fabrication." In the former, cement is produced with either alumina, sulphuric acid, phosphorus or derivatives. From triple fabrication is derived cement with alumina and sulphuric acid, or alumina and phosphorus, etc.

Cement and Alumina

The dual purpose process yielding cement and alumina involves various stages, such as (1) heating a suitable mixture of silico-aluminous mineral and limestone to obtain very friable calcium aluminates and bicalcic silicate; (2) dissolving the aluminates in very dilute alkaline carbonate; (3) precipitating lime with sodium carbonate; (4) precipitating alumina with carbon dioxide and recovering sodium carbonate; and (5) making up residue for re-heating and cement production.

Lafuma emphasises here the importance of precipitating crystalline hydrated alumina by a recycling method similar to that used with magnesia. The product of the first roasting is obtained in an extremely fine state, with particle size generally below 50 microns, which greatly expedites production of a solution of the calcium aluminates. The extent of contact surface is vastly increased and from a cement point of view the material is in fact remarkably good.

Most of the lime present is already free of carbonate, and practically the whole of the silica, iron, and alumina are combined in the mix. What may be called a supercement is obtained. Other advantages of this method, called the Séailles process, have been noted.

Triple Fabrication

The typical example of triple fabrication is cement, sulphuric acid, and alumina, from gypsum and such other material as is necessary. The first roasting is merely to decompose the sulphate. If properly done there is no need to fear any undesirable reactions of the sulphate, and a friable or powdery clinker is obtained containing soluble aluminates. The clinker is leached to extract alumina and the residue made up or corrected for conversion into Portland cement.

Similarly, the production of cement and cast metal may be facilitated. In the first stage the metallic melt and a mixture of soluble aluminates and bi-calcic silicate are obtained either by (a) clinkering similar to that of the Basset process, or (b) fusion, with formation of blast furnace slag. Either of these may be effected during the softening stage of the calcium silico-aluminates. This period of softening varies considerably with different slags, even though they have the same melting point, so that it is necessary to select those having most favourable rate of softening.

Lafuma and co-workers have given special attention to this point, in the case of auto-pulverulent aluminous mixtures, *e.g.*, in the ternary systems: C_2S—CA—CA_2; especially to the ratio SiO_2/Al_2O_3. This ratio preferably should be high. As practical confirmation it was found, at the d'Alhandra works, that the Basset furnace worked continuously on auto-pulverulent clinker without difficulty.

These aluminium slags have excellent purifying qualities and the metal melt obtained is very pure. After being leached for removal of the alumina the

residue is available for Portland cement.

The triple fabrication of cement, alumina, and phosphorus or derivatives could doubtless be dealt with in a similar manner. The work, however, is at present only in the laboratory stage, whereas in the other cases wide confirmation has been provided. Manufacturing experience is at the moment the source of most interest. The French Service des Poudres has at present in hand the changeover of the Miramas factory—hitherto using the I.G.F. method for cement and sulphuric acid—to produce alumina and sulphuric acid, and possibly, later, cement also. Other examples include the manufacture of alumina from power station slags and of super-cement by re-roasting the residues. Two factories are mentioned: one in Czechoslovakia and the other near Berlin—during the war.

Ammonium sulphate has likewise been included in cement manufacture, based on the well-known reaction $(NH_4)_2CO_3 + CASO_4 = (NH_4)_2SO_4 + CaSO_3$ and using gypsum as raw material. Gypsum must, however, be on or near the site of manufacture, as costs are too high to permit heavy transport charges.

If cement production be included, *e.g.*, by addition of inert clay—which incidentally facilitates the general process—the project becomes more interesting. The carbon dioxide recovered in the waste gases is usable for preparing ammonium carbonate. The reaction then becomes:

$$CaSO_4 + 2NH_3 + CO_2 + H_2O = (NH_4)_2SO_4 + SaCO_3.$$

This is the same as or closely resembles the Séailles process, and may be regarded as profitable, since one of the products is obtained practically free of cost. The ratio of products is roughly: 12 tons cement, 10 tons sulphuric acid, and 1 ton alumina.

Lafuma concludes with a note on marine magnesia for cement, its recovery from the sea having been simplified by Séailles. The first precipitation yields a voluminous deposit; a second precipitation makes available a "seed," and by a series of such operations a hydrate is obtained which is very easily decanted and filtered. The method is similar to that used for alumina.

The magnesia is about 97 per cent pure, as compared with the usual 90 per cent. Although impurities must naturally play an important part both in magnesia refractories and cements, it is rather remarkable that, in giobertite, nature has so measured and disposed the impurities as to yield the best industrial magnesia.

In conclusion, it is pointed out that the industrial possibilities of oxyphosphate cements have by no means yet been fully explored.

Milk De-salting Process

THE firm of "Elact," G.m.b.H., of Bregenz-Vienna, has developed an apparatus which removes electro-dialytically certain salts from milk and whey and which also reduces acidity to some extent. These salts, it is pointed out, affect adversely the taste of milk product and therefore limit its uses. This is particularly true of cow's milk, with a natural salt content of 0.75 per cent, when it is turned into dry products from which other milk components (*e.g.*, fat) have been removed.

The elimination of this taste factor opens up new possibilities for the utilisation of milk and milk residue products, particularly for pharmaceutical and dietetic purposes. By the process the salts are "rinsed out." Acidulation of the fluid is prevented by a special pole reversion method, since, without this, the stability of the albumin bodies would be endangered and the albumin would separate as a flocculent precipitate. To produce 1 litre of de-salted fluid requires 1/10th kWh.—*Reuters.*

Problems For Chemical Engineers

BELIEF that solution of chemical engineering problems involved in the development of nuclear energy will provide the key to the whole situation was expressed by Sir John Cockcroft, director of the Atomic Energy Research Establishment at Harwell, speaking in Glasgow. Emphasising that the work was still in the development stages, he defined as the conditions for successful operation: the development of material which will withstand the intense bombardment inside reactors; the solution of the breeding problem; solution of the metallurgical problems associated with very high temperature operation; development of economical chemical processing for nuclear fuel; the safe and economical disposal of radioactive wastes.

The programme called for the creation of a number of experimental power producers to give experience of operating problems. Building of these would occupy the next three to five years. There was also a need for large-scale laboratory research.

Technical Publications

CHEMICALS used in fire retardant treatments and the important rôle of chemistry in the study of the initiation of fires, their extinction, inhibition and suppression are emphasised by S. H. Clarke in "Fire Research Organisation," now available as *F.P.A. Journal* reprint No. 3 which describes the work of the Joint Fire Research Organisation established by the Department of Scientific and Industrial Research and the Fire Offices' Committee at Boreham Wood, Elstree, Hertfordshire. Other *FPA Journal* reprints now issued are "Building Boards in Relation to Fire Protection" (No. 4), by R. C. Bevan, and "Fire Resistance Grading of Elements of Structure" (No. 5).

* * *

THE basic properties of lead sheet and pipe of high corrosive resistance and their flexibility and ease of working have made these materials of great value to the chemical and building industries. General information on the manufacture and use of lead sheet and pipe, application of alloys of lead and technique in lead working are contained in Bulletin No. 115 available from the Lead Industries Development Council.

* * *

DISPOSAL of by-products is an important factor in the economics of gas supply, and the extent of that undertaking at the product works at Beckton and Southall is shown in a new booklet isssued by the North Thames Gas Board. During a year this plant deals with 42 million gal. of crude oil, 9 million gal. of benzol, 105 million gal. of ammoniacal liquor and 13,500 tons of spent oxide while the refined chemicals produced are used for a variety of purposes ranging from dyes, plastics and explosives to fertilisers, waterproofing, and tar for road making. The research unit of the North Thames Gas Board is the largest in the industry for the study of problems of production and the utilisation of gas, coke, and by-products.

* * *

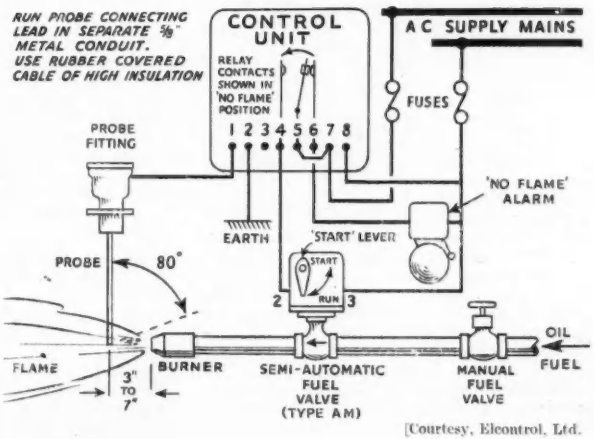
SOME of the newer electronic aids to laboratory and process work shown by Mullard Electronic Products, Ltd., at the electronic exhibition in London are illustrated with technical descriptions in the latest 16-page booklet issued by the Communications and Industrial Valve Department.

* * *

A COMPLETE understanding of why materials react in certain ways under given conditions is bound to help not only the producer but also the buyer. A concise non-technical survey on gelatin—its composition, extraction, grading, etc.—has recently been issued as a booklet entitled "The Story of Gelatine," by Alfred Adams & Co., Ltd., West Bromwich. An appendix gives the British Standards Institution methods of sampling and testing gelatin.

FURNACE SAFETY

Risk of explosion which occurs in an oil- or gas-burning furnace on re-ignition following flame failure is prevented by an automatic method in the Elcontrol Safeguard Equipment. The flame forms a part of the electrical circuit, which is automatically broken by any flame failure, thus instantly closing the fuel valve



[Courtesy, Elcontrol, Ltd.

• PERSONAL •

FUNDAMENTAL matters of atomic energy were discussed in Edinburgh last week at a three-day conference of scientists presided over by SIR CHARLES G. DARWIN, director of the National Physical Laboratory, Teddington. PROF. NIELS BOHR was the principal guest of honour at an evening reception to the delegates who included representatives of nearly all the European countries, America and India.

PROF. E. L. HIRST, Forbes Professor of Organic Chemistry, University of Edinburgh, has been appointed president of the chemistry section of the British Association which will meet at Birmingham next year from August 30 to September 6.

DR. ROBERT WRIGHT has retired from Glasgow University where he had held the post of senior lecturer in physical chemistry for the past 30 years. His research work has been mainly devoted to the study of solutions.

PROFESSOR THEODOR SVEDBERG, Swedish Nobel prizewinner and professor of physics at Uppsala University, is on a visit to this country. He is chairman of Atom Energy, Ltd., the State-owned company which has the monopoly of developing atomic energy in Sweden.

PROFESSOR D. H. HEY, professor of chemistry at King's College, has been appointed to the Daniell chair of chemistry at the college. He will succeed PROF. A. J. ALLMAND, who will retire at the end of the 1949/50 session.

The council of the British Export Trade Research Organisation has appointed MR. ROGER FALK as its first director general. He is taking up his duties in the New Year but is already engaged in a survey of the BETRO activities. Mr. Falk, who is 39, is at present managing director of an advertising agency specialising in export markets.

MR. S. MITCHELL has been appointed to a senior lectureship in chemistry at Glasgow University.

MR. LEWIS GILMOUR WHYTE has been appointed a director of Petrochemicals, Ltd.

MR. A. J. HIPPERSON, who has been associated with the British Welding Research Association since its inception, has been appointed leader of a team of development and liaison engineers set up by the association to increase production knowledge in the industry.

DR. WALTER J. MURPHY, of Washington, D.C., American Chemical Society editor, has been chosen to receive the 1950 gold medal of the American Institute of Chemists for his outstanding contributions to the advancement of the chemical profession. The medal is awarded annually for noteworthy service "to the science of chemistry or the profession of chemist in America."

MR. E. V. MURPHREE, president of the Standard Oil Development Company, New York, has been awarded the Perkin Medal by the American section of the Society of Chemical Industry. This medal is given annually for outstanding work in applied chemistry. It was founded in commemoration of the 50th anniversary of the coal tar colour industry. Mr. Murphree, who in July addressed members of the Oil Industries' Club in London, on the subject of "Oil for the Future," is the holder of some 21 patents. He has published more than 25 scientific papers, on synthetic rubber, catalytic cracking, and application of the fluid solids technique to producing synthetic liquid fuels, etc.

Obituary

THE death occurred on November 20 of MR. J. P. D. COLEMAN, who until his retirement in 1948 was a director of Wild-Barfield Electric Furnaces, Ltd. He had served the electrical industry since 1896, and had been associated with the late Mr. E. P. Barfield from that time. He joined him again in 1919 as works manager of the newly formed electrical furnace company. He became works director in 1933.

The death is reported from the U.S.A. of MR. JAMES R. HOBBINS, aged 66, president of the Anaconda Copper Mining Co., since 1940. He was visiting Butte, Montana, on a routine inspection when he had a sudden heart attack, on November 14, and subsequently died. Mr. Hobbins was president of numerous other companies, and a director of the Mines Investment Corporation and other bodies.

HOME

Fresh Scope for Lithopone

Extensions to be carried out at the Crown Chemical Works, Birtley, owned by Durham Chemicals, Ltd., include the provision of further bays to house a lithopone plant.

Workpeople at Firm's Annual Meeting

Employees from the firm's plants at Birmingham and Willesden attended the annual general meeting of Triplex Safety Glass Co., Ltd., held in London last week. There were eight from the benches and several foreman, all members of the joint production committees.

Coal Production

Output of deep-mined coal in Britain last week was the highest since the week ending December 18 last year. Comparative figures are:—Last week: 4,529,300 tons (deep-mined 4,290,900 tons, opencast 229,400 tons); corresponding week of 1948: 4,320,700 tons (deep-mined 4,135,700 tons, opencast 185,000 tons).

More Fats, Less Sugar

Supplies of oils and fats from non-dollar sources will be substantially greater in 1950 than in 1949, says a Ministry of Food Press notice. It will be possible from the end of February to make some increase in the allocations of fat for certain food industries. Allocations of sugar for some manufacturing processes will be reduced as from January 1, 1949, to facilitate reduction of dollar imports.

Caustic Potash

A Press note from I.C.I., Ltd., referring to the Board of Trade decision to enable caustic potash and carbonate of potash to be dealt with by private trade from January 1 next, points out that the group's General Chemicals Division will have available supplies of caustic potash liquor (50 per cent alkalinity calculated as KOH) for those who are not accustomed to import solid grade.

Chemicals in the 1951 Festival

Described as the most striking building planned for the South Bank Exhibition of the Festival of Britain in 1951, the Dome of Discovery, a huge aluminium structure, 97 ft. high and 365 ft. in diameter, is to house a display devoted to physical and chemical research and its application to industry among other science exhibits. Chemicals and allied products will also be well represented.

Duty Exemption

A further exemption from Key Industry Duty of three chemical materials was announced this week. They affect crude bismuth oxychloride, crude cerium chloride and calcium citrate (fermentation) during the period November 24-December 31, 1949. The relevant order is S.I. 2123.

Food Ministry Factory

A Ministry of Food scheme to establish in Aberdeen an experimental factory for the full-scale processing of food under commercial conditions has been announced by Dr. Norman Wright, Scientific Adviser to the Ministry of Food. It is hoped the factory will help to bridge the gap between research and the application of its results.

Chemical Engineering Castings

The British Standards Institution has recently published British Standard 1591, covering the requirements for acid-resisting high silicon iron castings for chemical engineering purposes. The chemical composition of the castings and the procedure for chemical analysis are specified. Details are also provided relating to heat treatment, freedom from defects, porosity, repairs to castings, welding, marking and packing, inspection and testing facilities.

Lead and Zinc Cheaper

By two reductions since Monday last week, the Ministry of Supply price for good soft pig lead has been reduced to £97 per ton. The Ministry zinc price has also been reduced by £2 to £85 10s. per ton. These last reductions took effect on Wednesday this week. A rise of £1 15s. in the price of zinc oxide was announced on November 10. Red seal is now £82 5s., green seal £83 15s., and white seal £84 15s., per ton, delivered, for 2-ton lots.

Co-operative Research

In furtherance of its co-operative investigation programme, the Manchester Section of the Oil and Colour Chemists' Association is asking for volunteers willing to undertake the analytical work necessary in the determination of the non-volatile content of paint media. Offers to undertake such work are invited by the section's honorary research liaison officer, Mr. T. E. Johnson, John Mathews & Co., Ltd., Vauxhall Road, Liverpool 3, who will provide particulars of the work involved and apparatus required.

AMERICAN CHEMICAL NOTEBOOK

From OUR NEW YORK CORRESPONDENT

NEW forms of Teflon tetrafluoroethylene resin have now been developed by E. I. Du Pont de Nemours & Company, which developed the original form of the plastic during the war. Evolution of the new forms, although they are not yet in commercial production, is regarded as being almost as important as the discovery of the plastic itself. Teflon has been difficult to fabricate and up to now it has only been possible to make the plastic by slow and costly methods in relatively simple shapes with limited industrial uses. Du Pont research recently established that Teflon could be made in a form in which fine particles of the plastic are suspended in a liquid. This led to useful developments—in procuring the adhesion of Teflon and metals and in spray finishes. Five new finished products will soon be available. They are: Industrial spray finishes which may serve to give chemical tanks corrosion-resistant linings; enamels for insulating fine wire which can be coated at a rate of about 50 ft. a minute; compounds for extruding heavier insulation for wire at rates up to 20 ft. a minute; unsupported Teflon film in thinner gauges; and coated glass fabrics. The plastic will resist the attack of nearly all chemicals up to 500° F. Teflon insulation may make it possible to raise power capacities of electric motors without increasing size. These suspensions will cost approximately $10 per lb. of solid content.

* * *

A new ultra-sensitive method for rapidly detecting the presence of small quantities of hydrogen sulphide in gases is being used successfully in research at the U.S. Bureau of Mines Synthesis Gas Production Laboratory at Morgantown, West Virginia. It has been applied to the study of the purification necessary to meet the rigorous standards for gas used in the Fischer-Tropsch synthesis of liquid fuels. Using methylene blue as the indicator, the process detects concentrations of as little as 1/1000 g. of hydrogen sulphide in 100 cu. ft. of gas using a cubic-foot sample and duplicates the results with a high degree of accuracy on identical samples. The normal maximum tolerance in synthesis gas is 1/10 g. of sulphur per 100 cu. ft. of gas. In modifying previously tested methods using methylene blue as the indicator for hydrogen sulphide, a photoelectric colorimeter and a spectrometer were used. A suggested test procedure including the preparation of reagents is given in the bureau report.

* * *

A new lead alloy for use in the chromium plating industry, called "Nalco," has been introduced by the National Lead Company, New York. Designed to furnish considerably longer service, "Nalco" is used for tank linings, anodes, and heating-and-cooling coils, and is said to be substantially more resistant to the corrosive and pitting action of chromic acid solutions.

* * *

Methods to prevent pollution of the atmosphere are usually costly, but have occasionally proved capable of yielding profitable returns, in addition to the indirect benefits. The Detroit Edison Co. spent several hundred thousand dollars on equipment to collect the solid emission from its smoke stacks and is now selling the ash at a substantial profit, according to Weldon B. Gibson, Stanford University Research Institute, in his address to the first National Air Pollution symposium, Pasadena, California. Other instances cited by the speaker, were a Los Angeles firm which in return for its expenditure of $40,000 on equipment was now recovering daily $300 worth of lead oxide which formerly went to waste, and another company which was now selling $15,000 worth of sodium sulphate a month as reward for an investment of $125,000 on purification plant.

* * *

The U.S. Atomic Energy Commission has disclosed that its raw materials operations manager, Dr. J. K. Gustafson, is now in South Africa to survey prospects for mining uranium in the gold fields there. In Johannesburg Dr. Gustafson is conferring with British and South African Government officials. It is known that uranium had been found as a very minor constituent of some South African gold ores and there is a prospect that uranium could be mined as a gold by-product. The American Atomic Energy Commission at present depends upon supplies from the Belgian Congo and Northern Canada. In Canada, Dr. C. J. Mackenzie, chairman of the Atomic Energy Control Board, told the national Atomic Committee that the bulk of Canada's uranium goes to the U.S.A. for bomb production.

OVERSEAS

Aluminium Hydroxide for Argentina

Imports of aluminium hydroxide into the Argentine will in future be free from import duties if intended for the manufacture of certain vaccines, states *Reuter*.

No Bids for German Patents

The Swedish Foreign Capital Control Office states that it has received no bid for the 34 patents, formerly German-owned, offered for sale. Some inquiries had been received from Great Britain. The period for accepting bids has been extended.

Raising Copper Output

The Chilean Government has announced that the Chile Exploration Company has undertaken to raise the production of copper at its Chuquicamata mine by 20 per cent—from 25 million to 30 million lb. monthly—owing to increased consumption needs in the U.S.A.

Australia to Make Cellulose Acetate

A new plant, estimated to cost about £2.25 million, is now under construction in New South Wales for the production of cellulose acetates by C.S.R. Chemicals, Ltd., a subsidiary of the Colonial Sugar Refinery Group. It is hoped eventually to meet the requirements of Australia's plastic manufacturers and also to produce a number of organic chemicals at present imported.

U.S. Aluminium Output

Production of primary aluminium in the U.S.A. in August was 52,005 short tons, a drop of 7 per cent. The average daily rate of production was the lowest for over a year, and August was the first month of this year in which output did not exceed the corresponding month of 1948. Market conditions improved, shipments from reduction plants totalling 57,403 tons, and stocks began to decrease.

Scientific Research in Hyderabad

The foundation stone of a new centre of scientific and industrial research, similar to the Indian national laboratories now being set up, was laid recently by the military governor of Hyderabad, Major-General J. N. Choudhury. Research in the laboratory will be both of a fundamental and applied nature, aiming, in particular, at the promotion of the chemical industries, and technical development and utilisation of local materials. The State of Hyderabad is known to be particularly rich in oil, coal and clays.

Italy Exports Fertilisers

During the first half of this year Italy exported fertilisers of a total value of L.3,063 million and imported only L.867 million. Before the war, Italy exported no fertilisers.

Dutch Instruments Company

The firm of Landys & Gyr, of Zug, Switzerland, is to establish a subsidiary company in Waalwijk, Holland, with an initial capital of fl.500,000, to make metallurgical, mechanical, electro-technical and thermic apparatus.

Canadian Titanium Ore

Titanium bearing iron ore deposits in the Lake Tio district in Quebec, operated by the Iron & Titanium Corporation, are expected to be in production within two years. The 27-mile railway from Havre St. Pierre to the deposits is now nearing completion. Ore will be smelted at Sorel, about 30 miles down the St. Lawrence from Montreal.

Norway's Rising Coal Total

Reports from Norway indicate that in spite of the almost complete destruction during the war of the Norwegian-owned coal mines in Spitzbergen, output for the current year is estimated at 400,000 metric tons against 300,000 tons in 1938. A further increase in output will depend on finding new uses for coal, possibly for the production of synthetic petrol for foreign markets.

Synthetic Rubber Preferred

Synthetic rubber roller coverings are now being used for spindles in the Australian textile industry in increasing numbers. Attempts to utilise natural rubber have not been successful because of its antipathy to oil. The synthetic coverings are replacing leather and cork, and in the woollen ring spinning frames approximately 98 per cent of the spindles are so equipped.

Synthetic Wax for Coatings

A new synthetic wax, Ceramid, an alkyl stearamide, is now being produced in commercial quantities in the U.S.A. Chemically, it is hard, light yellow in colour and melts between 79.5°-80.5° C. It is insoluble in water and is more soluble in organic solvents than natural and other commercial synthetic waxes. Its most promising use is for protective coatings and films deposited out of a solvent solution.

Next Week's Events

MONDAY, NOVEMBER 28

The Royal Institute of Chemistry

London: Woolwich Polytechnic, S.E.18, 7.30 p.m. (With Woolwich Polytechnic Scientific Society). A. C. Monkhouse: "The Minor Constituents of Coal."

Incorporated Plant Engineers

Leeds: University, 7.30 p.m. "Ventilation and Dust Extraction."

TUESDAY, NOVEMBER 29

Society of Instrument Technology

London: Manson House, Portland Place, 7 p.m. G. Russon and P. Rodieq: "Development of Instrumentation on the Martin Open Hearth Furnace in France."

Society of Public Analysts and Other Analytical Chemists

London: Imperial College of Science and Technology, South Kensington, S.W.7, 6 p.m. (Physical Methods Group). Fifth annual general meeting, followed by lecture. Dr. J. G. A. Griffiths: "The Mass Spectrometer, a Survey of its Applications in Analysis."

WEDNESDAY, NOVEMBER 30

The Chemical Society

Cardiff: University College, 7 p.m. Dr. G. Gee: "Some Recent Advances in the Physical Chemistry of High Polymers."

The Royal Society

London: Burlington House, Piccadilly, W.1, 2.30 p.m. Anniversary meeting.

Royal Society of Arts

London: John Adam Street, Adelphi, W.C.2, 2.30 p.m. H. Moore (Professor of Glass Technology, Sheffield University) and L. H. A. Pilkington: "Recent Advances in the Manufacture of Plate and Sheet Glass."

British Association of Chemists

London: Welcome Research Institution, 183 Euston Road, N.W.1, 7 p.m. Dr. E. Sunderland: "A New Method of Synthesising Resins and Plasticisers."

THURSDAY, DECEMBER 1

The Chemical Society

Nottingham: University, 6.30 p.m. (With Nottingham University Chemical Society). Original papers.

Sheffield: University, 5.30 p.m. (With Sheffield University Chemical Society). Dr. W. A. Waters: "Some Oxidations Involving Free Radicals."

FRIDAY, DECEMBER 2

The Chemical Society

Birmingham: University, Edgbaston, 6.30 p.m. (With Birmingham University Chemical Society). Dr. W. A. Sexton: "Chemical Constitution and Biological Activity."

Manchester: Gas showrooms, Town Hall Extension, 6.15 p.m. (With RIC and SCI). Prof. M. G. Evans: "Some Studies of Oxidation-Reduction Reactions."

Institute of Physics

London: 47 Belgrave Square, S.W.1, 5.30 p.m.. (Industrial Spectroscopy Group). Dr. A. G. Gaydon (Imperial College of Science and Technology). "Recent Developments in the Spectroscopic Study of Combustion Processes."

Ramsay Chemical Dinner

Glasgow: Beresford Hotel, 6.45 p.m.

SATURDAY, DECEMBER 3

British Interplanetary Society

London: Lecture theatre, Science Museum, South Kensington, S.W.7, 6 p.m. Film display. "Operation Backfire" and "Atomic Physics."

Fluorine Chemistry Symposium

DEVELOPMENTS in fluorine chemistry will be discussed at a meeting organised by the Chemical Society at the Royal Institution, Albemarle Street, London, on Wednesday next.

Professor H. J. Emeléus has arranged the symposium which will be held in two sessions beginning at 2.30 p.m. and 8 p.m.

In the afternoon, papers for discussion will be as follows. A. J. Rudge (I.C.I. General Chemicals, Widnes): "The Production of Fluorine"; R. le G. Burnett and A. A. Banks (I.C.I. General Chemicals, Widnes): "The Preparation and Properties of Chlorine Trifluoride"; H. J. Emeléus, A. G. Sharpe and A. A. Woolf (Cambridge): "Bromine Trifluoride as an Ionising Solvent"; M. G. Evans, E. Warhurst and M. Whittle (Manchester): "The Bond Dissociation Energy of Fluorine"; M. G. Evans and E. Warhurst (Manchester): "The Reaction of Fluorine Compounds with Sodium Atoms"; and M. Stacey (Birmingham): "Synthesis and Significance of Fluorocarbons."

Two further papers will be given in the evening, "Some Reactions of Trifluoromethyl Iodide and Pentafluoroethyl Iodide," by Miss J. Banus (Cambridge) and "Trifluoroacetic Acid and its derivatives," by J. C. Tatlow (Birmingham).

SPANISH AGRICULTURAL CHEMICALS

Large Increases of Home Production Proposed

ONE of the most comprehensive studies of Spanish needs of fertilisers and agricultural chemicals in general, with detailed proposals for the home production of some of the former, is the report which has been presented to the Spanish Syndical Council. The principal features of this report have been presented in *ION* (1949, August, September, 461-4, 473-6, 523-528).

The urgent problem in Spain is to increase agricultural production. Three basic factors are involved: agricultural machinery and transport, fertilisers and anticryptogams, and improved selected seed. The second of these factors is considered in detail under two sections or phases, the first of which relates to the actual present position as to supply and demand: and the second, to possibilities of extension to the level desired.

Considering first nitrogenous fertilisers, the present demand is estimated at 140,000 metric tons of nitrates of soda and lime, and 360,000 tons of ammonium sulphate or its equivalents, or a total, in terms of nitrogen, of 93,000 tons. (All tonnages quoted are metric tons.) Only 6.8 per cent of this was produced at home, so that the greater part has to be imported.

Small Imports

Imports have, however, been entirely inadequate, totalling only 152,330 tons of sulphate and nitrates in 1948 (90,000 tons nitrate). The principal firms contributing to the small home production are: Energia e Indust. Aragonesas S.A., Soc. Iber. del Nitrogeno, Soc. Electroquim. de Flix, whose activities are described in some detail, together with a comparison of prices of home and imported fertiliser. Consideration of respective prices of ammonia and ammonium sulphate shows that it has been much more profitable to sell ammonia as such than convert it to sulphate. Imported ammonium sulphate, mostly English, has commanded higher prices than home-produced, namely, at £25 per ton or 1500 pes. in the Spanish market, as compared with 1200 pes. for the home product. Spanish factories mentioned are by no means working to capacity which is 14,500 tons of nitrogen, while actual output is only 6500 tons. Among measures proposed to remedy the position is that of subsidising or otherwise assisting the home industry, so that the prices obtained are equal to, or higher, than those of imports; or a greater tariff on the foreign material.

Consumption of phosphates, mainly in the form of superphosphate, has fluctuated widely during the past 20 years, reaching just over 1 million tons yearly during 1927-1935, falling to 200,000 tons during the Civil War. In 1947, 365,000 tons was consumed and, in 1948, 710,000 tons.

Natural Phosphates

Quantities of other phosphate, such as natural phosphates and basic slag, are almost negligible, about 7000 tons each in 1935—the latest figures available. Total national capacity is said to be, for 35 factories, 1.75 million tons, but actual output would appear to be far below this, and various measures are proposed to increase it, including larger and cheaper supplies of lead (for sulphuric acid), sodium nitrate, cheaper power and transport, etc., also stricter control of imports, and some alleviation in transport charges.

Consumption of potash in Spain is given only for the years prior to the Civil War, when it was about 24,000 tons in terms of K_2O. Production of potassium sulphate fell from 2164 tons in 1945 to 1498 tons in 1948. Output of potassium chloride in terms of K_2O in 1948 was 165,000 tons. Potash fertilisers are therefore considered to be in sufficient supply.

In regard to pest control chemicals, use of copper sulphate in Spain in 1935 required 15,500 tons, and consumption is estimated to be about the same now. Total capacity of the many companies making pesticides is said to exceed home demand.

Principal firms are S. A. Cros, of Badalona and other places; Vicente Ros, of Martorell; Indust. Quim. del Valles, of Mollest; Fab. Quim. S.A., Valencia; Union Española de Explosivos, Madrid (Cerro de la Plata), and of Sevilla; Soc. M. & M. de Peñarroya; and Cia. Navarra de Abonos Quimicos, of Pamplona.

A common difficulty in recent years has been in connection with supplies of copper, and sulphate production has suffered accordingly. From 10,000 tons (of copper used) in 1946, it fell to 4000 tons (estimated) for 1949. Production in 1948 was slightly less.

The production of sulphur in Spain, to meet an annual consumption of 25,000

tons, both in the natural state and from pyrites, is said to permit a margin for export. The yield of natural sulphur has greatly declined, and the main source would appear to be pyrites. The Rio Tinto mines also seem to be a declining source, although, in 1948, they accounted for 90 per cent of a total sulphur production of 31,000 tons. It is thought that the best solution of the problem is the recovery of sulphur by a new method from the sulphides of zinc, or other sulphides, of which there are large deposits in Hinojedo-Torrelaguna (Santander) belonging to the Real Compañía Asturiana de Minas (Royal Asturian Mining Co.). This company has installed new plant for roasting the ores, recovering sulphur initially at a rate of 20,000 tons annually, with possibility of increase.

Need of Fertilisers

Spain is said to have almost the worst fertilised agriculture in Europe. The vast possibilities of increased use of fertiliser are reported to the Syndical Council in this form:—

	Present consumption in 1000	*Potential consumption metric tons*
Phosphates	875	4347
Potash	48	600
Nitrogenous	404	1450

Increase in yields per hectare (in metric quintals of about 2 cwt.) of the principal crops in Spain, by adequate use of fertilisers is estimated thus: wheat 3, barley 4, maize 5, roots and potatoes 60, pastures and leguminous forage crops 8, other legumes (peas and beans) 2, olive plantations 5, and vineyards 8.

Areas of these crops in 1000 hectares are: wheat 3586.6, barley 1523.8, maize 352.8, roots, etc., 508.3, pastures, etc., 191, peas and beans 1057, olives 2166, vineyards 1501. Increased values of crops by adequate fertilising would therefore total about 8533.4 million pesetas, at current prices.

This does not include possible extension of cultivated acreage through irrigation or other means, which is discussed in some detail. And nothing is said about area under oranges or other fruit and vegetables. The extent of irrigated lands in Spain at present is about 1.45 million hectares, and plans have been approved which would approximately double this. (Inst. Nac. de Colonización.) Even with a minimum allocation of nitrogenous fertiliser to cultivated land at present available the total demand in terms of nitrogen could well be raised to 320,000 metric tons annually.

Considering next the possibilities of increasing home production, two firms at least hope to enlarge their output within the next year or two. Soc. Iber. del Nitrogeno has a new plant completed or nearly so, and by 1952 should have a capacity augmented by 9000 tons of nitrogen. Energia e Indust. Aragonesas is also installing new plant at Sabiñánego (Huesca) for 3780 tons of nitrogen (18,000 tons of ammonium sulphate) by 1951, to employ the additional power from the new electric power station at La Sarra y Sallent (120 million kWh per annum).

New plant is also being installed by Sefanitro, which hopes to produce 120,000 tons of ammonium sulphate yearly by 1951. Hidronitro Española at Monzon (Huesca) will obtain nitrogen by fractionation and will by 1951 be producing 6400 tons of nitrogen (as cyanamide) and 6600 tons as ammonia. Nitratoa de Castilla, S.A., will produce at Valladolid ammonia by electrolytic methods, yielding ultimately some 64,000 tons of calcium nitrate.

Many of these new enterprises are having difficulty in securing plant. This applies to the Cia. Españ. del Azoe, which plans for 6000 tons of nitrogen yearly, and to the I.N.I., whose new factory at Escatron may yield 150,000 tons of ammonium sulphate, from lignite gas, while another at Puertollana may afford 40,000 tons of ammonium sulphate and 16,000 tons of calcium nitrate, and a third at Puentes de Garcia Rodriguez 30,000 tons of ammonium nitrate.

New Projects

Most of these new projects have been delayed. Thus the Soc. Iber. de Nitrogeno needs cement, iron and steel, and machinery; and most of the others urgently want machinery, the cost of which has been calculated in various currencies.

In these Spanish estimates of requirements up to 1952 little change in demand for phosphates and potash is foreseen, although the extensive irrigation plans are capable of affecting these also.

Nor is copper sulphate considered in this second national development-survey. For sulphur, the Royal Asturian Mining Co., as stated, is installing plant, and proposes to use the Trail (Canada) process of the Consolidated Mining & Smelting Co., Ltd., for concentration of SO_2 and its reduction to sulphur. It is proposed to import the reduction plant and manufacture the concentration plant in Spain. Total demand, including industrial uses, is more than 50,000 tons.

Law and Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

MERTHYR TYDFIL CERAMICS, LTD., Cardiff. (M., 26/11/49.) October 26, deb. (referred to in the agreement dated August 12 and reg. August 17, 1949), to H.M. Treasury Solicitor securing £75,000 (not ex.); charged on specified lands at Merthyr Tydfil, and a general charge.

SECOMASTIC, LTD., London, W, manufacturers of jointing compound. (M., 26/11/49). October 26, £2500 (not ex.) charge, to Lloyds Bank, Ltd.; charge on leasehold factory premises at Power Road, Chiswick. *——. January 13, 1949.

VITREOUS ENAMELLING INDUSTRIES (BRADFORD), LTD. (M., 26/11/49.) October 25, charge, to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; charged on land and buildings known as Alexandra Shed, Parsonage Road, Laisterdyke, Bradford. £7697. August 2, 1948.

Satisfaction

VITREOUS ENAMELLING INDUSTRIES (BRADFORD), LTD. (M.S., 26/11/49.) Satisfaction October 28, of mortgage reg. September 26, 1946.

Increases of Capital

The following increases in registered capital have been announced: MONCKTON COKE & CHEMICAL CO., LTD., from £170,000 to £210,000. EAGLESCLIFFE CHEMICAL CO., LTD., from £150,000 to £250,000.

New Registrations

County Lime Co., Ltd.

Private company. (475,017). Capital £4000. Manufacturers of agricultural lime, fertilisers, chemical manures, etc. Directors: J. C. Allen, R. S. Smith. Reg. office: 3 Cambray Place, Cheltenham.

Universal Solvents (Brighton), Ltd.

Private company. (474,851). Capital £1000. Manufacturers of liquid and other soaps, bleaches, ammonia and other scouring and bleaching materials, etc. Directors: M. B. Morley, E. P. A. Smith, K. T. Gibbon. Reg. office: 50 Shirley Street, Hove 3.

Cement and Manganese

THE annual report of Pretoria Portland Cement Co., Ltd., states that clinker production started at the new factory at Orkney in July, and cement production in August. The time for the completion of the extensions at Slurry still depends on the delivery of certain plant and equipment due in the latter half of the year. Deliveries of new plant ordered for the expansion of the Eastern Province Cement Co., Ltd., have been disappointing, and work in this connection is likely to be delayed. It is hoped, however, to start production at the new plant of the Premier Portland Cement Co. (Rhodesia), Ltd., during the latter half of the year. Imports of cement were continued by the Rhodesian Government. The company's last annual profits increased from £413,603 to £501,733 after providing £110,109 for taxation.

A Brazilian report states that the surface deposits of manganese, having a metallic content of about 55 per cent, discovered several years ago in the Serra do Navio region of the Federal Territory of Amapá, may afford approximately 10 million tons of ore. Although the extraction would present little difficulty, the comparative inaccessibility of the deposits raises a transport problem, requiring the building of a 200 km. railway to a point on the River Amazon where suitable deep-water loading facilities could be developed. The railway would cost about Cr$150 million, and construction of the river port would require a further Cr$7,500,000.

Reduced Profit

Union Chimique Belge, Brussels, reports for the financial year to June a slightly reduced gross profit of B.fr.114.5 m. (117.2 m.). Net profits totalled B.fr.49.2 m. against 52.5 m. A net dividend of B.fr.50 (30) is to be paid on the share capital.

Chemical and Allied Stocks and Shares

HELPED by Sir Stafford Cripps's latest review of financial and economic conditions, British Funds maintained their rally, and markets generally have been steadier. Caution remained the keynote, with a tendency to await the result of the £10 million South Africa loan. No further evidence has been given of official support for gilt-edged by the Government broker, but it is assumed generally that the authorities are determined to prevent long-dated British Funds going to a higher yield basis than 4 per cent.

Leading industrial shares rallied with gilt-edged, and chemical and kindred shares also benefited, being better on balance, although the best levels reached were not fully maintained.

Imperial Chemical were 42s. 9d., after touching 43s. 6d. and now yield 4⅜ per cent on the basis of last year's 10 per cent dividend. Monsanto changed hands around 50s., Fisons were 27s. 9d., Albright & Wilson 5s. shares 30s., Amber Chemical 2s. shares 4s. 3d., and F. W. Berk 2s. 6d. shares showed activity around 13s. Elsewhere, Bowman Chemical were 6s. 9d., and Brotherton 19s. 3d., with Calor Gas at 17s., Pest Control 8s. 1¼d., and Boake Roberts easier at 27s. 6d. British Chemical & Biologicals 4 per cent preference were 18s. 9d., and L. B. Holliday 4½ per cent preference 19s. 9d.

Glaxo Laboratories at £21 have been a good feature on the full results and chairman's annual statement, which emphasised the good earning power and financial strength. Even after provision for the share bonus, remaining reserves will equal one and a half times the increased issued capital. In other directions, British Xylonite have been steadier at 53s. 9d., British Glues & Chemicals 4s. shares were 17s., British Industrial Plastics 2s. shares better at 5s., with De La Rue 23s. 9d., and Erinoid easier at 5s. 9d.

Elsewhere, Staveley were well maintained at 78s. 3d., and Laporte Chemicals 5s. ordinary 9s. 6d., with Lawes Chemical 10s. shares at 9s. 6d. xd.

Iron and steels moved higher, encouraged by the fact that nationalisation cannot now take place until January 1, 1951, at the earliest. United Steel were 28s., Dorman Long rose to 31s. 6d., helped by the big profit increase for the past financial year; while Hadfields were 27s. 3d., Stewarts & Lloyds 52s. 9d., Beardmore 44s. 9d., and Colvilles 34s. 7½d. Elsewhere, Guest Keen were 40s. 3d., Babcock & Wilcox 59s., and Firth Brown 70s. 1½d.

Turner & Newall at 74s. 6d. responded to the rally in industrials, and United Molasses have been active up to 38s. on the company's further expansion in shipping activities indicated by the offer to acquire control of Anchor Line.

British Aluminium have been more active up to 41s. 3d. on the assumption that the company may find more scope following reduced aluminium supplies from Canada which will result from the need to save dollars. Amalgamated Metal shares at 17s. 9d. have been unaffected by the re-opening of the London Metal Exchange for dealing in tin. There is talk that free dealings in copper may be restarted early next year.

Boots Drug showed more activity around 48s. 9d., British Drug 5s. shares were 6s. 6d., Sangers 22s. 1½d., and Beechams deferred 14s. 9d. After rising to 62s. 9d., Dunlop Rubber came back to 61s. 9d. Tube Investments were firmer on the full report and accounts, changing hands at slightly below £5¾. Borax Consolidated remained a firm feature at 58s. Oil shares failed to hold all earlier gains, Shell being 69s. 4½d., and Anglo-Iranian £7⅛.

Ultramar Oil shares have fluctuated between 7s. 6d. and 8s. 3d. awaiting news of the outcome of the company's negotiations to obtain additional capital.

£4 Million for Cellulose and Acid

A/S BORREGAARD, the Norwegian company manufacturing cellulose acetate, acids, etc., and employing 10,000 workers at its factories in Norway, Sweden and Austria, has decided to increase its share capital from the equivalent of £3.75 million to £5 million to carry out expansion plans costing an estimated £4 million. New plant for the annual production of 90,000 tons of cellulose is to be built at Sarpsborg, Norway. A second plant there will produce 3000 tons of cellulose wool yarn a year, and another is to concentrate on cellulose acetate, acetate silk, acetate foil and plastic powder. A fourth is designed to produce at least 15,000 tons of sulphuric acid annually.

In Austria, where modernisation is also planned, the company's two factories have a total yearly capacity of 50,000 tons of bleached cellulose, 7000 tons of fine paper and 5 million litres of spirit. A/S Borregaard's external sales last year amounted to £15 million.

Prices of British Chemical Products

Steady Demand Largely Met by Supplies

TRADING conditions on the industrial chemicals market are continuing along satisfactory lines with the demand from home users well maintained, both as regards delivery specifications and the placing of new business. There is also a fair weight of fresh inquiry for export in evidence. So far as values are concerned, the undertone is very firm. A steady demand persists for most of the soda compounds and the potash chemicals remain firm. Formaldehyde is in good call, while both hydrogen peroxide and bleaching powder are receiving a fair amount of attention. All grades of borax and boric acid are meeting with a fair inquiry and a good demand is reported for the non-ferrous metal products. In this market there has been a further reduction in red and white lead prices owing to a decrease in the controlled price of the metal. The new basis price for white lead is £127 15s. per ton and the new basis price for red lead £119 10s. per ton. Brighter conditions continue to prevail on the coal tar products market, buyers taking rather more interest than of late.

MANCHESTER.—Firm price conditions have been reported in most sections of the Manchester chemical market and trading has been fairly active in a wide range of products. Textile chemicals are being taken up in good quantities in Lancashire and the West Riding of Yorkshire and there is steady pressure for deliveries under contracts from the rubber, paint and other principal using trades. Replacement buying during the week has been fairly brisk on home trade account and additional inquiries have been circulating from shippers.

GLASGOW.—All classes of chemicals have been fairly well taken up in the Scottish chemical market during the past week. The shortage of Glauber salts, commercial and desiccated, continues, and there is no doubt that the position has been worse this year than previously. Indications are that there is a continuing increase in consumption of this product in Scotland and little or no additional productive capacity. An increasing interest is being shown in sodium chlorate for bleaching purposes.

Price Changes

Rises: Acetic anhydride, arsenic, copper sulphate, zinc oxide, cotton acid oil.

Reductions: Red lead, orange lead, white lead, Empire stearine.

General Chemicals

Acetic Acid.—Per ton: 80% technical, 1 ton, £61; 80% pure, 1 ton, £66; commercial glacial 1 ton £71; delivered buyers' premises in returnable barrels; in glass carboys, £7; demijohns, £11 extra.

Acetic Anhydride.—Ton lots d/d, £110 per ton.

Acetone.—Small lots: 5 gal. drums, £90 per ton; 10 gal. drums, £85 per ton. In 40/45 gal. drums less than 1 ton, £70 per ton; 1 to 9 tons, £69 per ton; 10 to 50 tons, £68 per ton; 50 tons and over, £67 per ton.

Alcohol, Industrial Absolute.—50,000 gal. lots, d/d, 2s. 1d. per proof gallon; 5000 gal. lots, d/d, 2s. 2½d. per proof gal.

Alcohol, diacetone.—Small lots: 5 gal. drums, £133 per ton; 10 gal. drums, £128 per ton. In 40/45 gal. drums: less than 1 ton, £113 per ton; 1 to 9 tons, £112 per ton; 10 to 50 tons, £111 per ton; 50 to 100 tons, £110 per ton; 100 tons and over, £109 per ton.

Alum.—Loose lump, £17 per ton, f.o.r. MANCHESTER: Ground, £17 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—2 cwt. non returnable drums; 1 ton lots £40 per ton.

Ammonium Carbonate.—1 ton lots: MANCHESTER: Powder, £52 d/d.

Ammonium Chloride. — Grey galvanising, £22 10s. per ton, in casks, ex wharf. Fine white 98%, £21 to £25 per ton. See also Salammoniac.

Ammonium Nitrate.—D/d, £18 to £20 per ton.

Ammonium Persulphate.—MANCHESTER: £5 per cwt. d/d.

Ammonium Phosphate.—Mono- and di-, ton lots, d/d, £78 and £76 10s. per ton.

Amyl Acetate.—In 10-ton lots, £171 10s. per ton.

Antimony Oxide.—£140 per ton.

Antimony Sulphide.—Golden, d/d in 5 cwt. lots, as to grade, etc., 1s. 9½d. to 2s. 4¾d. per lb. Crimson, 2s. 6½d. to 3s. 3½d. per lb.

Arsenic.—Per ton, £38 5s. to £41 5s., ex store.

Barium Carbonate.—Precip., d/d; 2-ton lots, £25 15s. per ton, bag packing, ex works.

Barium Chloride.—£35 to £35 10s. per ton.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £26 10s. per ton d/d; 2-ton lots, £26 15s. per ton.

Bleaching Powder.—£25 15s. per ton in casks (1 ton lots).

Borax.—Per ton for ton lots, in free 140 lb. bags, carriage paid: Anhydrous, £59 10s.; in 1-cwt. bags, commercial, granular, £36; crystal, £38; powder, £39; extra fine powder, £40; B.P., granular, £45; crystal, £47-£48; powder, £48-£48 10s.; extra fine powder, £49-£49 10s.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granular, £64 10s.; crystal, £70; powder, £67 10s.; extra fine powder, £69 10s.; B.P., granular, £76 10s.-£79 15s.; crystal, £82; powder, £79 10s.-£81 15s.; extra fine powder, £81 10s.-£83 15s.

Butyl Acetate BSS.—£149 10s. per ton, in 10-ton lots.

Butyl Alcohol BSS.—£145 10s per ton, in 10-ton lots.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid, £8 per ton, in 4 ton lots.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated. £30 per ton.

Chlorine, Liquid.—£28 per ton d/d in 16/17-cwt. drums (3-drum lots).

Chrometan.—Crystals, 6d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6¾d., other, 1s. 5.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Cobalt Oxide.—Black, delivered, 8s. 5d. per lb.

Copper Carbonate.—MANCHESTER: 1s. 6½d. per lb.

Copper Chloride.—(53 per cent), d/d, 1s. 11d. per lb.

Copper Oxide. — Black, powdered, about 1s. 4½d. per lb.

Copper Nitrate.—(53 per cent), d/d, 1s. 9½d. per lb.

Copper Sulphate.—£47 5s. per ton f.o.b., less 2%, in 2-cwt. bags.

Cream of Tartar.—100%, per cwt., about £7 8s. per 1-2 cwt. lot, d/d.

Ethyl Acetate.—10 tons and upwards, d/d, £103 10s. per ton.

Formaldehyde.—£31 per ton in casks, according to quantity, d/d. MANCHESTER: £32.

Formic Acid.—85%, £64 per ton for ton lots, carriage paid. 90%, £67 5s. per ton.

Glycerine.—Chemically pure, double distilled 1260 s.g. £123 per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; carriage paid for bulk lots.

Hydrochloric Acid.—Spot, 7s. 6d to 8s 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—1s. 0½d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 10s. 4d. to 14s. 6d. per lb., according to quantity.

Iron Sulphate.—F.o.r. works, £3 15s. to £4 per ton.

Lactic Acid.—Pale, tech., £80 per ton; dark tech., £70 per ton ex works; barrels returnable.

Lead Acetate.—White, £107 per ton. (Nominal.)

Lead Carbonate.—British dry, ton lots, d/d, £115 10s. (Nominal.)

Lead Nitrate.—About £116 per ton d/d in casks. MANCHESTER: £110.

Lead, Red.—Basis prices per ton: Genuine dry red lead, £119 10s., orange lead, £131 10s. Ground in oil: red, £140 10s., orange, £152 10s.

Lead, White.—Basis prices: Dry English, in 8-cwt. casks, £127 15s. per ton. Ground in oil, English, under two tons, £146 10s.

Lime Acetate.—Brown, ton lots, d/d, £18 to £20 per ton; grey, 80-82 per cent, ton lots, d/d, £22 to £25 per ton.

Litharge.—£119 10s. per ton.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £27.

Magnesium Carbonate.—Light, commercial, d/d, £70 per ton.

Magnesium Chloride.—Solid (ex wharf), £20 to £25 per ton.

Magnesium Oxide.—Light, commercial, d/d, £160 per ton.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., lump, 7s. 4d.; smaller quantities dearer.

Mercurous Chloride.—8s. to 9s. per lb., according to quantity.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methanol.—Pure synthetic, d/d, £28 to £38 per ton.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 3s. 7½d. per gal.; pyridinised 64° O.P. 100 gal., 3s. 8½d. per gal.

Nickel Sulphate.—F.o.r. works, 3s. 4d. per lb. (Nominal.)

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—£128 to £133 per ton packed in free 5-cwt. casks.

Paraffin Wax.—Nominal.

Phosphoric Acid.—Technical (S.G. 1.500), ton lots, carriage paid, £61 per ton; B.P. (S.G.1.750), ton lots, carriage paid, 1s. 1d. per lb.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 9¾d. per lb.; ground, 10¾d. per lb., for not less than 6 cwt.; 1-cwt. lots, ½d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £64 per ton for 1-ton lots, ex store; hydrated, £58 for 1-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Chloride.—Industrial, 96 per cent, 6-ton lots, £16.10 per ton.

Potassium Iodide.—B.P., 11s. 1d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 7½d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 6d. per lb.; technical, £7 9s. 6d. to £8 3s. 0d. per cwt.; according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—First lump, spot, £48 per ton; dog-tooth crystals, £50 per ton; medium, £48 10s. per ton; fine white crystals, £21 to £25 per ton, in casks, ex store.

Salicylic Acid.—MANCHESTER: 1s. 11d. to 3s per lb. d/d.

Soda Ash.—58° ex depôt or d/d, London station, £7 12s. 6d. to £8 7s. 6d. per ton.

Soda, Caustic. — Solid 76/77%; spot, £20 14s. per ton d/d.

Sodium Acetate.—£41-£55 per ton.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 8d. per lb.; anhydrous, 7¼d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite. — Powder, 60/62%, £28 7s. 6d. per ton d/d in 2 ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2-cwt. free bags.

Sodium Chlorate.—£52 to £57 per ton.

Sodium Cyanide.—100 per cent basis, 8d. to 9d. per lb.

Sodium Fluoride.—D/d, £4 10s. per cwt.

Sodium Hyposulphite.—Pea crystals 22s. 6d. per cwt. (2-ton lots); commercial, 1-ton lots, £16 per ton carriage paid. Packing free.

Sodium Iodide.—B.P., 10s. 2d. per lb. to 12s. 1d. according to quantity.

Sodium Metaphosphate (Calgon).—Flaked, loose in metal drums, £101 10s. ton.

Sodium Metasilicate.—£19 to £19 5s. per ton, d/d U.K. in ton lots.

Sodium Nitrate.—Chilean Industrial, 97-98 per cent, 6-ton lots, d/d station, £20 10s. per ton.

Sodium Nitrite.—£29 10s. per ton.

Sodium Percarbonate.—12½% available oxygen, £7 per cwt. in 1-cwt. drums.

Sodium Phosphate.—Per ton d/d for ton lots: Di-sodium, crystalline, £32 10s., anhydrous, £65; tri-sodium, crystalline, £32 10s., anhydrous, £62.

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Silicofluoride.—Ex store, nominal.

Sodium Sulphate (Glauber Salt).—£8 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. £6 per ton d/d station in bulk. MANCHESTER: £6 10s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot. £24 per ton, d/d, in drums; broken, £24 15s. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £13 18s. 6d. to £16 3s. 6d., according to fineness.

Sulphuric Acid.—168° Tw., £6 2s. to £7 2s. per ton; 140° Tw., arsenic free £4 18s. 6d. per ton; 140° Tw., arsenious, £4 11s. per ton. Quotations naked at sellers' works.

Tartaric Acid.—Per cwt: 10 cwt. or more £8 10s.; 5 to 9 cwt. £8 12s.; 2 to 4 cwt. £8 14s.; 1 cwt. £8 16s.

Tin Oxide.—1-cwt. lots d/d £25 10s. (Nominal.)

Titanium Oxide.—Comm., ton lots, d/d, (56 lb. bags) £102 per ton.

Zinc Oxide.—Maximum price per ton for 2-ton lots, d/d: white seal, £84 15s.; green seal, £83 15s.; red seal, £82 5s.

Zinc Sulphate.—Nominal.

Rubber Chemicals

Antimony Sulphide.—Golden, 4s. to 5s. per lb. Crimson, 2s. 7½d. to 3s. per lb.
Arsenic Sulphide.—Yellow, 1s. 9d. per lb.
Barytes.—Best white bleached, £11-£11 10s. per ton.
Cadmium Sulphide.—6s. to 6s. 6d. per lb.
Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.
Carbon Black.—6d. to 8d. per lb., according to packing.
Carbon Tetrachloride.—£56 to £59 per ton, according to quantity.
Chromium Oxide.—Green, 2s. per lb.
India-rubber Substitutes.—White, 10 5/16d. to 1s. 5¾d. per lb.; dark, 10¼d. to 1s. per lb.
Lithopone.—30%, £36 15s. per ton.
Mineral Black.—£7 10s. to £10 per ton.
Mineral Rubber, "Rupron."—£20 per ton.
Sulphur Chloride.—7d. per lb.
Vegetable Lamp Black.—£49 per ton.
Vermillion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, in December, £10 3s. 6d., rising by 1s. 6d. per ton per month to March, 1950.
Compound Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. No. 1 grade, where available, £10 14s. 6d. I.C.I. Special No. 1, £15 16s., rising by 2s. 6d. per ton per month to June, 1950. National No. 2, £10 18s. per ton.
"Nitro-Chalk."—£10 4s. per ton in 6-ton lots, d/d farmer's nearest station.
Sodium Nitrate.—Chilean for 6-ton lots d/d nearest station, £11 per ton.

Coal-Tar Products

Benzol.—Per gal. ex works: 90's, 2s. 6d.; pure, 2s. 8½d.; nitration grade, 2s. 10½d.
Carbolic Acid.—Crystals, 10¾d. to 1s. 0½d. per lb. Crude, 60's, 4s. 3d. MANCHESTER: Crystals, 10¾d. to 1s. 0½d. per lb., d/d crude, 4s. 3d., naked, at works.
Creosote.—Home trade, 6½d. to 9¾d. per gal., according to quality, f.o.r. maker's works. MANCHESTER: 6½d. to 9¾d. per gal.
Cresylic Acid.—Pale, 98%, 3s. 9d per gal.; 99%, 3s. 1d.; 99.5/100%, 4s. 4d. American, duty free, 4s. 2d., naked at works. MANCHESTER: Pale, 99/100%, 3s. 11d. per gal.
Naphtha.—Solvent, 90/160°, 2s. 10d. per gal. for 1000-gal. lots; heavy, 90/190°, 2s. 4d. per gal. for 1000-gal. lots, d/d. Drums extra: higher prices for smaller lots. Controlled prices.
Naphthalene.—Crude, ton lots, in sellers' bags, £8 1s. to £12 13s. per ton according to m.p.; hot-pressed, £14 15s. to £15 14s. per ton, in bulk ex works; purified crystals, £28 to £43 5s. per ton. Controlled prices.
Pitch.—Medium, soft, home trade, 100s. per ton f.o.r. suppliers' works; export trade, £6 to £7 per ton f.o.b. suppliers' port. MANCHESTER: 100s. f.o.r.
Pyridine.—90/140°, 22s. to 23s. per gal.; 90/160°, 21s. MANCHESTER: 19s. to 22s. 6d. per gal.
Toluol.—Pure, 3s. 2d. per gal.; 90's, 2s. 4d. per gal. MANCHESTER: Pure, 3s. 2½d. per gal. naked.
Xylol.—For 1000-gal. lots, 3s. 3½d. to 3s. 6d. per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton; grey, £22.
Methyl Acetone.—40/50%, £56 to £60 per ton.
Wood Creosote.—Unrefined, from 3s. 6d per gal., according to boiling range.
Wood Naphtha.—Miscible, 4s. 6d to 5s. 6d. per gal.; solvent, 5s. 6d. to 6s. 6d. per gal.
Wood Tar.—£6 to £10 per ton.

Intermediates and Dyes (Prices Nominal)

m-**Cresol** 98/100%.—Nominal.
o-**Cresol** 30/31° C.—Nominal.
p-**Cresol** 34/35° C.—Nominal.
Dichloraniline.—2s. 8½d. per lb.
Dinitrobenzene.—8½d. per lb.
Dinitrotoluene.—48/50° C., 9½d. per lb.; 66/68° C., 1s.
p-**Nitraniline.**—2s. 5d. per lb.
Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyers' works.
Nitronaphthalene.—1s. 2d. per lb.; P.G. 1s. 0½d. per lb.
o-**Toluidine.**—1s. per lb., in 8/10-cwt. drums, drums extra.
p-**Toluidine.**—2s. 2d. per lb., in casks.
m-**Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

LONDON: November 23. Unrefined, per ton, naked ex works, cotton acid oil £94. The price of all other unrefined oils and fats remains the same until December 3. Refined, per ton c.i.f., Empire stearine, in soft wood barrels, £117 15s.; in casks or drums, £116; in hardwood barrels, £121 15s. Other refined oil prices are unchanged during the 8-week period ending December 31.

U.S. MINERALS

Some Record Tonnages

A GENERAL survey of the mineral industry in 1948 is contained in the market reports just issued by the Bureau of Mines, United States Department of the Interior.

Sales of bromine compounds by primary producers in 1948 totalled 90,338,555 lb. gross weight, which was a slight reduction on the previous year, but well above the figure for 1946. The bulk of the bromine sold was in the compound ethylene dibromide for use in gasoline anti-knock compounds.

Tonnages of both caustic-calcined and refractory grades of magnesia, sold or used by producers, were appreciably greater in 1948 than in the previous year. Caustic-calcined sales reached 33,209 short tons, while a new record of 330,069 short tons was established by sales of refractory magnesia. Output of crude magnesite in 1948 cannot be published as this would reveal the production of individual companies.

A steady increase has marked the production of calcium chloride (and calcium-magnesium chloride) from natural brines over the past five years. Total output for 1948 set up a new record of 301,936 short tons, an increase of 30,730 tons over 1947, and 100,972 tons more than in 1944.

Boron minerals in 1948 showed a decrease in domestic production of approximately 10 per cent compared with 1947. The total output of 450,932 short tons containing 134,700 tons of boron trioxide, was higher than in 1946 and the two previous years.

The serious shortage of alkalis which has existed for several years continued into the first part of 1948. In the latter part of the year, however, demand lessened and completion of most of the expansion programmes in the industry brought about a state of local over-supply to the market.

Sales of natural sodium carbonate totalled 288,769 short tons, natural sodium sulphate sales attaining a level of 265,862 short tons.

Works Fatalities

A VERDICT of accidental death, due to being caught under the guides of a hopper while stepping over a conveyor belt, was returned at the inquest, at Northwich, on Norman Evans, aged 40, chemical labourer, of Chapel Lane, Moulton, who died at the I.C.I. Lostock works, Northwich, after his chest had been pressed so hard against the moving band that he could not breathe. Mr. J. R. Allen, manager of the works, said his theory was that Evans' right foot slipped when he was stepping over the moving belt to clean up lime on the other side and that he must have winded himself or been knocked unconscious when he fell on the belt. Instructions had now been given to the men that they must not step over the band and the firm was seeking a new method of collecting the lime, so as to make it unnecessary for the men to go to the opposite side of the belt.

Mr. George Mills, aged 63, of David Street, Northwich, died in the Victoria Infirmary from severe burns received while at work at the Winnington plant of I.C.I., Ltd.

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SITUATIONS VACANT

None of the vacancies in these columns relates to a man between the ages of 18 *and* 50 *inclusive, or a woman between the ages of* 18 *and* 40 *inclusive, unless he or she is exempted from the provisions of the Control of Engagement Order, or the vacancy is for employment exempted from the provisions of that order*

EASTERN GAS BOARD
(Tottenham Division)

APPLICATIONS are invited from suitably qualified persons for the following technical appointments at the Tottenham Works (20 million cubic feet per diem) of the Division. Salaries in accordance with the A.P.T. Scales of the London Regional Joint Council for Gas Staffs.

(1) **SHIFT SUPERINTENDENT**

Candidates must have obtained the Higher Grade Certificate of the Institution of Gas Engineers in Gas Engineering (Manufacture) and have had considerable Gas Works operational experience.

Salary, £520 to £600 per annum (Grade A.P.T.8).

(2) **RELIEF SHIFT SUPERINTENDENT**

Preference will be given to candidates who are in possession of the Higher Grade Certificate of the Institution of Gas Engineers in Gas Engineering (Manufacture).

Salary, £440 to £520 per annum (Grade A.P.T.6).

(3) **LABORATORY CHEMIST**

The successful candidate will be required to take charge of the Chemical Laboratory at Tottenham Works. Candidates must hold a University Degree in Chemistry or an equivalent qualification and have had experience in the Gas, Fuel or Heavy Chemical Industries.

Salary, £520 to £600 per annum (Grade A.P.T.8).

Applications for the above appointments, stating age and giving full details of training, qualifications and experience, should reach the **Personnel Officer, Woodall House, 658, Lordship Lane, Wood Green, N.22, not later than December 10th, 1949.**

SITUATIONS VACANT

APPLICATIONS are invited from **QUALIFIED ENGINEERS,** B.Sc. or A.M.I.Mech.E., for important **Chemical Works, Manchester area.**

Applicants should not be over 40 years of age, and have experience in **Maintenance, Chemical Plant Erection** and **Design.** Position offered is permanent and progressive. Only men of proved ability need apply. Address in the first instance, with particulars of qualifications, experience in detail, and salary expected. Box No. 2872, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

THE UNIVERSITY OF ADELAIDE
SENIOR LECTURER IN CHEMICAL ENGINEERING

APPLICATIONS are invited for appointment as **SENIOR LECTURER** in Chemical Engineering. Salary range, £850–25–£1,000 (Australian).

Detailed terms of appointment may be obtained from the Secretary, The Association of Universities of the British Commonwealth, 5, Gordon Square, London, W.C.1, with whom applications must be lodged not later than January 31, 1950. Two copies of the application should be lodged with the Secretary of the Association and one copy sent by air to the Registrar of the University.

V. A. EDGELOE,
Acting Registrar.

A prominent firm of **Chemical Engineers** in S.W. London have a vacancy in their research laboratories for an **ANALYST.** Candidates should have had a sound scientific training, together with some years' experience of commercial analysis. Experience of metallurgical analysis would be a recommendation but is not essential. The commencing salary would depend upon age, and experience but would not be less than £400 per annum. A pension scheme is in operation. Conditions of work are good and publication of the results of original research in analytical chemistry is encouraged. Write Box No. N.3040, BENSONS, Kingsway Hall, London, W.C.2.

CHEMIST or **CHEMICAL ENGINEER** required to be responsible for development work and process control in a plywood factory in Nigeria.

Applicants should possess an Honours Degree in Science or an equivalent professional qualification. Some general industrial experience would be an advantage. Salary in accordance with age, qualifications and experience, but not less than £800 per annum. Special allowance for married men with children. Tours of 21 months with leave on full pay. Free passages, furnished quarters, medical attention in Africa and retirement benefits.

Applications should be addressed to : Lever Brothers & Unilever Ltd., (FMD) Personnel Division, Unilever House, Blackfriars, London, E.C.4.

CHIEF TECHNICAL OFFICER required by well-known Meter and Instrument Manufacturer. Applicants must possess first class experience in instruments and light mechanism technology with academic knowledge of physics and mechanical engineering to degree standard. Post is permanent and pensionable. Salary range £1,000 to £1,650 per annum depending on qualifications. Only men of first class ability and experience will be considered. **Applications, in strictest confidence to Chairman, Box C.A. 555 at 191, Gresham House, E.C.2.**

SITUATIONS VACANT

CORROSION ENGINEERS, preferably not over 35, required for large Oil Company for Middle East duties, for work connected with cathodic protection of thousands of miles of trans-desert pipelines and will include design, installation and operation of such protective schemes, together with study of pipe coating procedure and materials. Post offers extensive opportunities in new field to man of initiative. Candidates for acceptability should have Honours Degree in Electrical Engineering or Physics or Physical Chemistry, with strong background of electricity and engineering, and be able to combine first-rate theoretical background with bias to field work. Practical attitude and good knowledge of electro-chemistry essential. Experience should include minimum of five years' work in industry. The appointment would carry substantial allowances and would be at salary commensurate with general acceptability: the service is pensionable. **Write, quoting No. 409, to Box No. 3140, c/o Charles Barker & Sons, Ltd., 31, Budge Row, London, E.C.4.**

COMPANY near London invites applications from **GRADUATES,** preferably with some experience in Organic or Physical Chemistry, for **RESEARCH IN SYNTHETIC RESINS.** Write, giving full particulars and salary required, to Box No. 2870, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

MANUFACTURING Chemists in London require for research work a **QUALIFIED CHEMIST** with specialised knowledge of the soap and perfumery trade. Commencing salary £1,200 per annum, plus share of profits. Applications, giving complete details regarding age, qualifications, experience and previous positions held, should be sent to **Box No. 2875, The Chemical Age, Fleet Street, London, E.C.4.**

MINISTRY OF SUPPLY invites applications from Chemical Engineers for a vacancy in the grade of **PRINCIPAL SCIENTIFIC OFFICER** or **SENIOR SCIENTIFIC OFFICER** at a research establishment in the LONDON area.

Candidates must have good honours degree or equivalent in Chemical or Mechanical Engineering or Chemistry with post-graduate training in chemical engineering. Experience in development of chemical processes from laboratory stage to full production scale and wide knowledge of plant materials essential.

Post is unestablished but carries F.S.S.U. benefits. Successful candidates will be graded according to age, qualifications and experience as follows:—

Principal Scientific Officer – £950–£1,250.
Senior Scientific Officer – £700–£900.

Rates for women somewhat lower. Minimum age for P.S.O. normally 31 and S.S.O. 26.

Application forms obtainable from Technical and Scientific Register (K), York House, Kingsway, London, W.C.2, quoting F.814/49/B.Z. Closing date, 14 December, 1949. 4.11A10 (30).

WANTED by a North East Coast Engineering firm, young **CHEMICAL ENGINEER, about 25.** Must have degree and have had sound technical training. **Apply Box No. 2876. The Chemical Age, 154, Fleet Street, London, E.C.4.**

VACANCY for **TRAINED ANALYST** to take charge of regular chemical analyses of water samples. Salary on (provincial) scales for Assistant Experimental Officer (man, £220-£460; woman, £220-£380), or Experimental Officer (man, £495-£645; woman, £405-£520) in Scientific Civil Service, according to age, experience and qualifications. Superannuation scheme. Apply, with full details and names of two referees, to the **Director, Freshwater Biological Association, Wray Castle, Ambleside, Westmorland, before 31 December, 1949.**

SITUATIONS VACANT

THE Civil Service Commissioners invite applications for permanent appointments as **ASSISTANT EXPERIMENTAL OFFICER** to be filled by competitive interview during 1950. Interviews will be held shortly after the receipt of the completed application form and successful candidates may expect early appointments.

The posts are in various Government Departments and cover a wide variety of scientific (including engineering) qualifications. Places of work are spread throughout Great Britain.

Candidates must be at least 17½ years and under 26 years of age on 1st August 1949; time spent on a regular engagement in H.M. Forces may be deducted from actual age. Candidates must have obtained the Higher School Certificate with mathematics or a science subject as a principal subject, or an equivalent qualification. Higher qualifications will be regarded as an advantage to candidates over the age of 20.

The inclusive London salary scale (men) is £230–£490. Salaries for women and for posts in the provinces are somewhat lower. Superannuation provision is made under the Superannuation Act.

Further particulars and forms of application from the Secretary, Civil Service Commission, Scientific Branch, 27, Grosvenor Square, London, W.1, quoting No. 2522. Completed application forms should be returned as soon as possible.
2333/300.

YOUNG Man (22-25 years) required with training in **HEAT TRANSFER, FLUID FLOW AND COMBUSTION** to act as **ASSISTANT IN THE SERVICES DEPARTMENT** of a large chemical and metallurgical factory in the Outer London area. State age, training and salary required, Box No. 2874, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

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One—**MILD STEEL AUTOCLAVE OR CURING PAN,** 3 ft. 3 in. diam. by 4 ft. 9 in. deep by $\frac{7}{16}$ in. riveted plate, with hinged cover secured by 16 swing bolts. 60 lbs. per sq. inch working pressure. (Unused.)

One—**NEW "MORWARD" POWDER MIXER** with trough 6 ft. long by 2 ft. wide by 2 ft. deep, driven through fan-cooled gearbox from 6 h.p. motor, 400/3/50 cycles complete with starter.

One—**MILD STEEL TROUGH PAN DOUGH MIXER BY MARCHANT,** with pan 2 ft. 3 in. by 2 ft. 3 in. by 2 ft. 6 in. deep, steam jacketed, double stirring blades driven through gears from fast and loose pulleys.

One—**SHARPLES SUPER CENTRIFUGE** type MP4; Makers No. D535 1480, with inbuilt motor 2½ h.p. by BTH, suitable for 220/234 volts single phase or 380/440/3/50 cycles. Complete with starter. (New condition.)

One—**600 GALLON STEAM JACKETED MILD STEEL PAN,** 5 ft. 6 in. diam. by 5 ft. 6 in. deep, dish bottom, ¼ in. plate, 80 lbs. per sq. inch W.P. (Can be fitted with mixing gear if required.)

Two—**40 GALLON FULLY TILTING COPPER STEAM JACKETED PAN.** 2 ft. diam. by 2 ft. deep, mounted in trunnions and suitable for 100 lbs. per sq. inch w.p. in jacket.

Ten—**40 GALLON MILD STEEL STEAM JACKETED BOILING PANS,** 2 ft. by 2 ft. dish bottom with 2 in. run-off. Mounted on supporting legs and jackets suitable for 50 lbs. per sq. inch W.P.

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8 in. ROTARY VACUUM PUMP BY GENERAL ENGINEERING CO., of Ratcliffe. Size AV. 110G., Cap. 1,126 cu. ft. per min. at 23 in. vacuum. Machine No. 1357. Direct coupled by flexible coupling to a 45 b.h.p. motor by Laurence Scott 400/3/50, 585 r.p.m. With A.E.C. starter and isolator, automatic control panel giving visual indication. Unit complete with Foxborough control valve, gauges and connecting piping.

COMPLETE PERMUTIT "DEMINROLIT" WATER TREATMENT PLANT, 12,000 gal. output between regenerations, one regeneration per 24 hrs. Installation, including piping, valves, etc., and treated water storage tank, rubber lined throughout. Also including direct coupled motorized stainless steel centrifugal pump by Gwynne, and direct coupled motorized 2 in. centrifugal pump. All connecting piping and water testing apparatus.

COMPLETE DISTILLED WATER PLANT, comprising six steam heated Manesty stills, type No. 4, cap. 50 gal. per hr. each. One automatic loading tank. Two direct motor driven rotary pumps. Vert. pressure storage tank of welded construction, suitable lagged, approx. 11 ft. deep by 5 ft. 6 in.. diam., with raised manhole 2 ft. diam., with eighteen 1 in. diam. swing bolts for securing. Unit complete with all connecting piping, valves, etc.

SINGLE ROLL CHILLING MACHINE BY DOUGLAS, roll 5 ft. long by 3 ft. diam., arranged for brine circulation through glanded bearings. Complete with jacketed collecting trough with paddle type agitator. F. & L. pulley drive.

OVOID PRESS with twin horiz. opposed rolls, 24 in. diam., by 5 in. face, each having 96 indentations 1½ in. diam. by 1⅛ in. deep. Fitted conical feed hopper 1 ft. 5 in. sq. tapering to 5⅜ in. sq. by 10 in. deep. Spring adjustment to rolls. Drive through worm gear and pinion with extended pulley shaft.

BRIQUETTING PRESS BY W. M. JOHNSON. Output approx. 32,400 Briquettes, 4½ in. by 1½ in. by 1½ in. per hr. F. & L. pulley drive through machine cut gears. 7/10 h.p. required.

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ONE—Ditto, 546 cu. ft./min. at 10 lb. p.s.i., 960 r.p.m.
TEN—Andco 6 in. worm-operated **PLUG COCKS.**
FOUR—Andco 2 in. worm-operated **PLUG COCKS.**
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TEN—Andco 1 in. worm-operated **PLUG COCKS.**
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ONE—Steel-cased **WORM CONVEYOR,** 8 ft. long.
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ONE—Enclosed Cast-iron **BLENDING VESSEL,** 2 ft. 6 in. diam. by 4 ft. deep with agitator for 400 volts 3-phase, 50 cycles.
SIX—Enclosed Cast-iron **RECEIVERS,** 3 ft. diam. by 3 ft. 6 in. deep, fitted with brass basket coil and sight glasses.
ONE—All-brass **PRODUCT RECEIVER,** 2 ft. 11 in. diam. by 3 ft. 10 in. deep.
TWO—All-brass **PRODUCT RECEIVERS,** 2 ft. 11 in. diam. by 4 ft. 9 in. deep.
ONE—Lead-lined Welded M.S. **ETHYLENE COOLER,** 3 ft. diam. by 3 ft. 6 in. deep
ONE—All-brass **PRODUCT HEAD TANK,** 3 ft. 11 in. diam. by 4 ft. 9 in. deep.
ONE—M.S. **BLOW EGG.** 3 ft. diam. by 5 ft. deep.
FOUR—C.I. **CONDENSER SHELLS,** 2 ft. 9 in. diam. by 9 ft. long.
TWO—C.I. **BLENDING VESSELS,** 2 ft. 6 in. diam. by 4 ft. long.
TEN—C.I. **CATCHPOTS,** 1 ft. 6 in. diam. by 1 ft. 9 in. deep (three fitted lead coils).
EIGHT—C.I. **MIXING VESSELS,** 2 ft. 6 in. diam. by 2 ft. 3 in. deep.
ONE—Copper **BLOW EGG,** 2 ft. diam. by 3 ft. 3 in.
EIGHT—Enclosed C.I. **ETHYLENE RECEIVERS,** 3 ft. diam. by 3 ft. 6 in. deep.

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